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The Mining Journal

LONDON, JUNE 17, 1960

Vol. 254. No. 6513.

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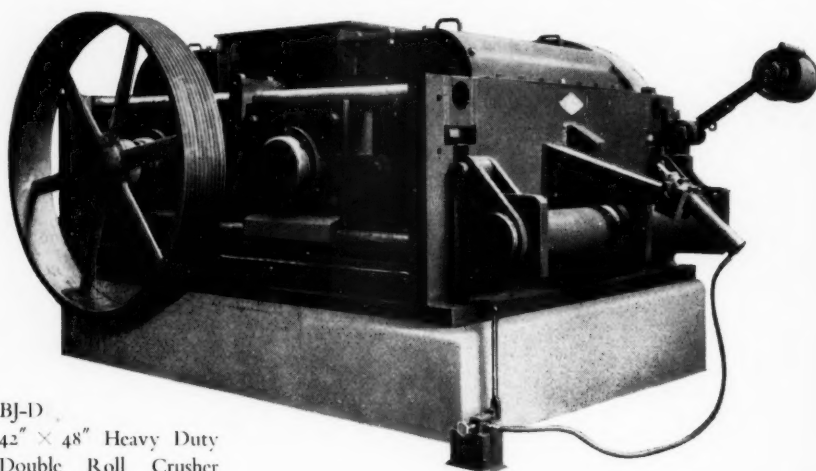
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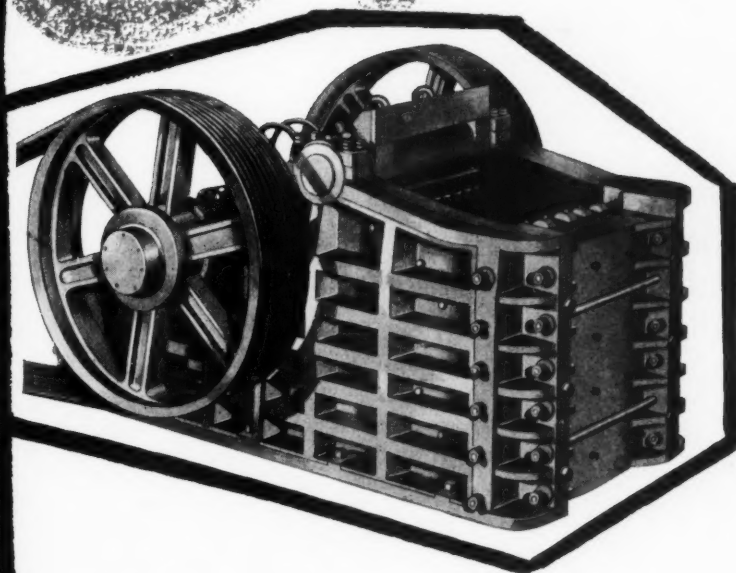
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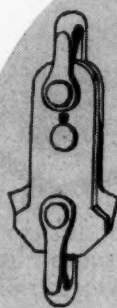
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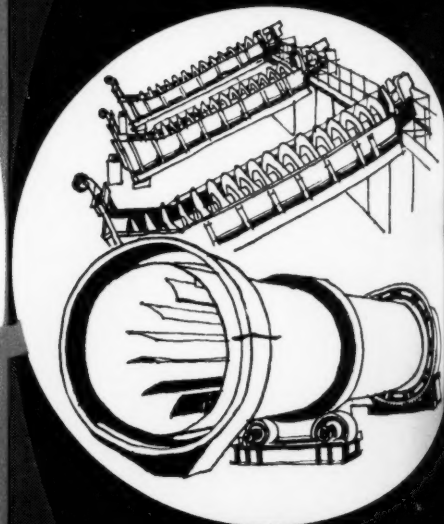
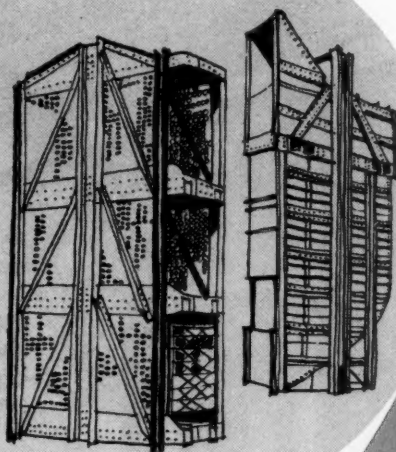
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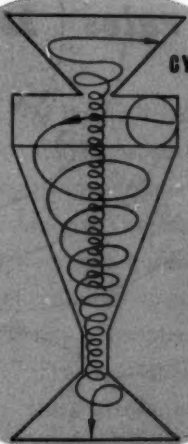
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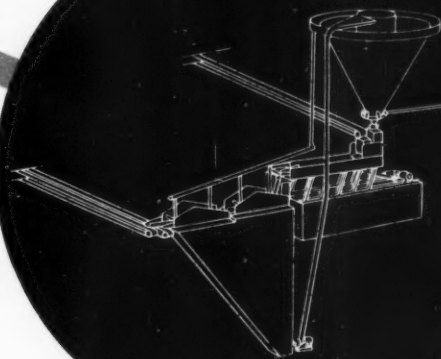
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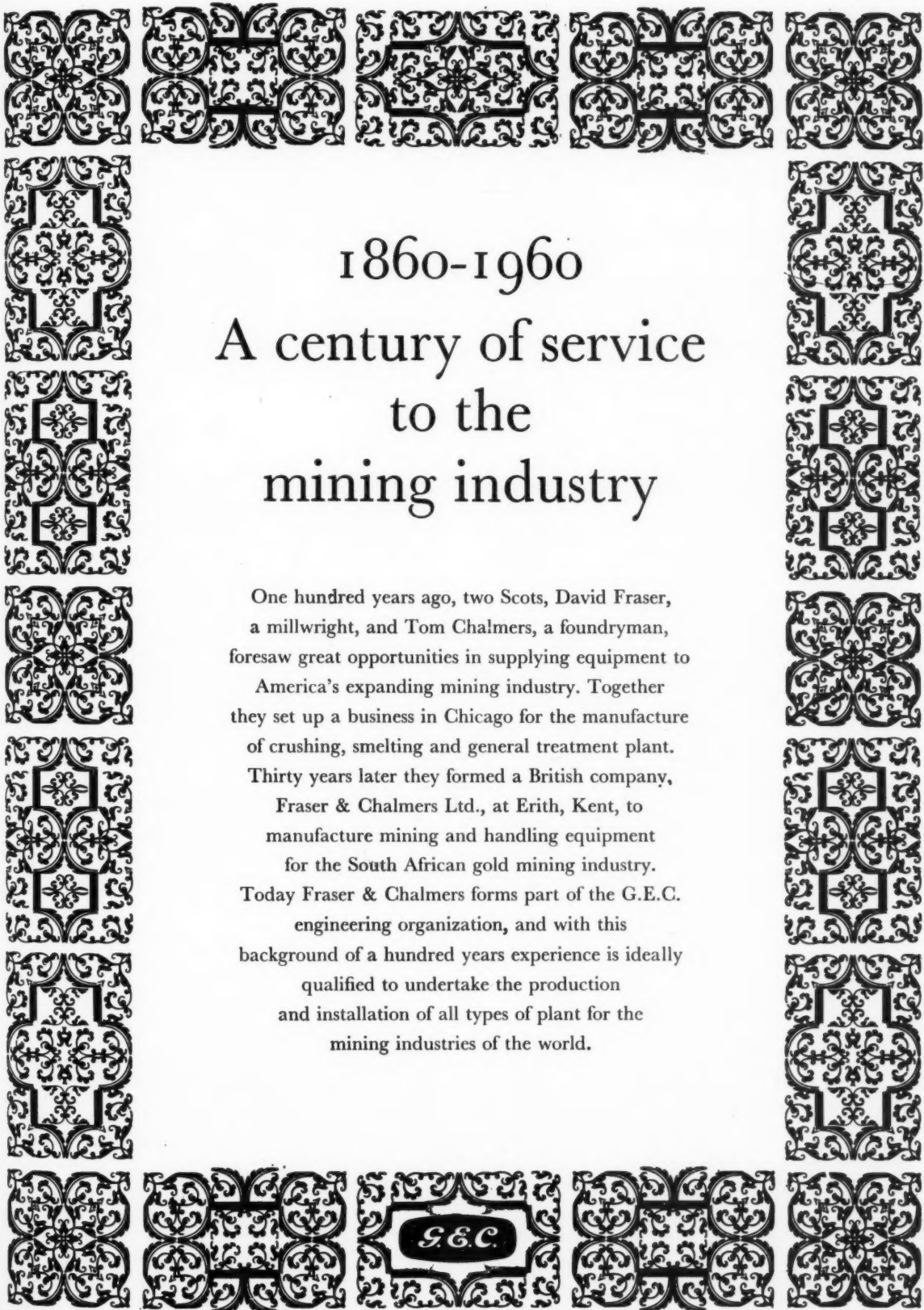
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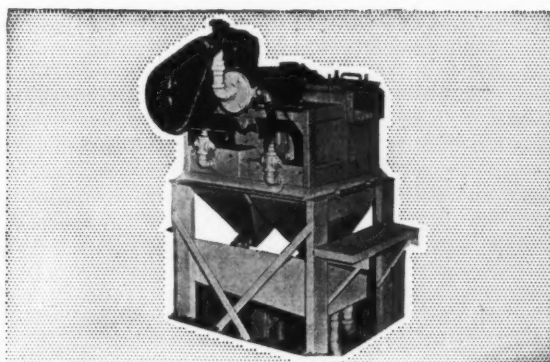
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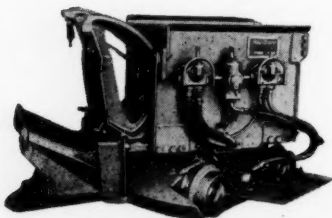
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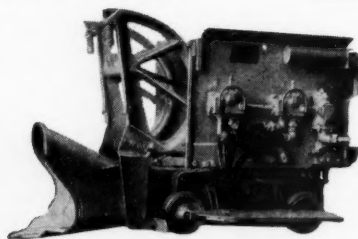
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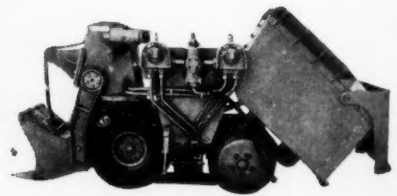
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The Mining Journal

London, June 17, 1960

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Coal in Perspective

PUBLISHED this month, the fourteenth annual report of the British National Coal Board contains the inevitable profusion of statistics and tables. Despite their formidable appearance they are worthy of careful scrutiny. Having so many "shareholders" it is perhaps to be expected that a nationalized industry should receive more than its due share of criticism and it is only when one reads carefully the annual reports issued by the State Boards that much of this criticism is seen to be unwarranted. In Britain, the Coal Board has been on a sticky wicket for the past two seasons and its main task in 1959 was, for the second year in succession, to regulate output so as to conform with a sharp fall in consumption. In this they were in a similar position to the coal industries of many other countries, including Belgium, France, Germany and Holland. Their primary objectives were to secure a reduction in output without undue harm to the future productive capacity of the industry, without a crippling loss of revenue, and without severe harm to the mining community, and in consequence to the national interest.

Between the end of 1956 and the end of 1959, the total consumption of British coal fell by 33,000,000 l. tons. There was a comparable fall between 1929 and 1932, and at the end of 1932, 350,000 miners were unemployed and most of the rest were on short time. The Board was determined that such a catastrophe should not, this time, befall the industry. Their policy was to continue the gradual reduction in deep-mined and opencast production that had begun in 1958, and to refrain from large-scale closures of collieries which would have caused the loss of valuable reserves of coal and heavy redundancy.

Over the three years 1957, 1958 and 1959, the productive capacity of the industry has been maintained, and by 1965 it will be capable of meeting the demand assumed in "Revised Plan for Coal" of 200-215,000,000 tons, mostly from new and reconstructed collieries. The labour force has been reduced by 70,000 but, by careful control of recruitment, and by careful re-deployment, only 1,300 of the men who worked at the 53 collieries which closed in 1959 were left without alternative employment at the end of the year. The cut in opencast production, from 14,300,000 tons in 1958 to 10,800,000 tons in 1959, has resulted in a severe loss of profit from opencast operations, but has lessened the effect of the fall in demand on the deep mines which last year produced 195,270,000 tons. From the financial aspect, 1959 proved a costly year to the Board. An overall loss of £24,000,000 created a new and unwelcome record. This deficiency was more than covered by the cost of stocking and picking up coal and coke, and the report reveals that during the year the stocks held by the Board increased from 19,500,000 to 35,700,000 tons.

On the credit side, productivity reached a record level of an O.M.S. overall of 1.332 tons — 5.3 per cent higher than in the previous year. This rise in productivity was largely due to a

continued increase in the use of power loading equipment underground, and by the end of the year the proportion of total underground output mechanically loaded had reached the record figure of 31.2 per cent. It is certain that if the demand for small coal had been maintained at the higher level obtaining three or four years ago the proportion of coal power loaded would have been significantly greater. However, as it was, the increase in productivity and operational efficiency was sufficient to absorb an increase in wages cost and to bring about a reduction in production costs of 1/6d. a ton.

What of the future? Despite the gloomy prognostications of many self-styled authorities, the report is optimistic: a cautious optimism perhaps, but based on a sound common-sense appraisal of the situation. The Board's revised plans for the next six years will ensure that, by 1965, the coal industry will be more compact, more efficient, and better able to compete with alternative fuels, with 80 per cent of its output coming from new and reconstructed collieries. The report does not gloss over the difficulties facing the industry but forecasts an efficient industry—somewhat smaller than originally envisaged—with an annual output of 200,000,000 tons to be maintained for a long time to come.

COPPER COMPANIES' AFRICAN EDUCATION PLAN

Intake of African children into Copperbelt schools will be increased by nearly 2,000 when the new school year in Northern Rhodesia starts next August. This is the first result of a proposal, announced a few weeks ago by the Rhodesian Selection Trust and the Rhodesian Anglo American groups of companies jointly to make available a total sum of £1,300,000 towards the cost of providing additional facilities for African education in the urban areas of the Western Province of Northern Rhodesia.

Building is already going on in seven Copperbelt centres and by August the first stage of the plan will be completed. This will provide three new schools, additional classrooms for a number of existing schools and housing for teachers, at an overall cost of approximately £94,000.

Within the Copperbelt there are approximately 10,000 children aged 8, which is the normal age of entry into African primary schools in the Territory. Of these about 85 per cent are at present receiving school education. It is estimated that in 1963 the total number of children of this age will increase to over 11,000, and that on the basis of present government plans only 77 per cent will be accommodated at school. In the same area there are about 50,000 children of primary school-going age (8 to 15 years) of whom about 56 per cent are enrolled at school. By 1963 it is estimated that this group will increase to 76,000 and that the primary schools will be able to accommodate only about 60 per cent of this number.

The companies' plans include the building of four secondary day schools at each of the four main copper-producing towns to provide junior secondary education. The plans also include extensions to the existing government secondary school at Ndola. It is intended to build an African teacher training college to provide the staff required for the expansion of the schools.

The programme to produce these additional educational facilities will inevitably take some time to complete and it is anticipated that the full facilities outlined will become available by 1967.

In addition to the plans already outlined, the copper companies are proposing to provide increased facilities for African further education in the Copperbelt and for a Federal-wide bursary scheme to assist Africans to obtain additional education after schooling. As regards the bursary scheme, it is recognized that there is a distinct need for assistance to enable more Africans to undertake studies in the

field of further education. Plans are also in hand to assist Africans to take correspondence courses and extra-mural courses in the general field of education. For these purposes, the companies intend to make available a total sum of £10,000 a year.

NORWAY'S MINING PROGRESS

According to a report in a review issued by the Oslo newspaper *Morgenbladet* last week, some 70 per cent of the country's iron ore output, 100 per cent of its ilmenite, 50 per cent of pyrites, 50 per cent of copper, zinc and lead concentrates and 100 per cent of columbium and molybdenum were last year exported by Norway. Actual production figures for the year were 1,500,000 tonnes of iron ore (almost all 66 per cent concentrates), 226,000 tonnes of ilmenite in the form of concentrates containing 44 per cent titanium oxide and 732,000 tonnes of pyrites. The selective flotation of pyrites yielded some 50,000 tonnes of copper, zinc and lead concentrates.

Elsewhere in the report it is indicated that 275,000 tonnes of ferro-alloys, including ferro-silicon, ferro-chrome, ferro-manganese and silicon-manganese, were produced in Norway in 1959. Some 115,000 tonnes of these consisted of ferro-silicon. Total export of ferro-alloys last year was higher than annual output, at 290,000 tonnes. Worth of these exports was 305,000,000 crowns, or £15,250,000.

The issue states also that 144,000 tonnes of aluminium last year, all of about 17,000 tonnes of which was exported. In the current year national aluminium output is expected to reach 175,000 tonnes and by 1965 over 200,000 tonnes. The country's leading producer, the State-owned firm of A/S Årdal og Sunndal Verk is so to increase its capacity at plants in Årdal and Sunndalsøra as to be turning out some 150,000 tonnes of aluminium from its smelters annually in five years' time.

This week comes news from the Norwegian Government that the Porsgrunds Porselænsfabrik is to start making porcelain from the abundant local mineral nepheline. The nepheline needed is planned to be produced at an annual level of 40,000 tonnes by Christiania Spigerverk at Stjernøya, in Finnmark. These nepheline deposits, situated near the port of Hammerfest, are said to be excellent by virtue of their composition for glass, porcelain and enamel manufacture.

Samples of ore, the Government also announces, which have been found at Hamarøy, in northern Norway, have been found by the Norwegian Atomic Energy Institute to contain 15.7 per cent uranium.

PROSPECTING IN COMMUNIST CHINA

Red China is so intent on speeding its industrialization that the Ministry of Geology has involved, in some areas, 70 per cent of the population in prospecting for new mineral deposits. In one province alone, Fukien, in 1958, some 200,000 people were mobilized for this purpose. These "prospectors" discovered 2,000 mineral occurrences, including 500 of iron. Though the geological administration found it possible to check only five per cent of the claims made by non-professional seekers, the quest persists.

These and other evidences of the vast scale of Red China's activities in this programme are related in *Mining Engineering*, official magazine of the Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers by Eugene A. Alexandrov, an editor of *Engineering Index*. His review is a report based on five recent articles from the Soviet Union.

Mr. Alexandrov cautions that the reader of articles published in the Soviet Union and in Red China must bear in mind that "much propaganda is added" and that in Red Chinese

announcements, "as in the Soviet Union, there is a general trend to conceal the true reserves of strategic minerals." But he concludes that "it is obvious that Red China is presenting another challenge to the West, and possibly within fifteen to twenty years, it will become a reality as an industrial, military, and economic power."

The article says that there are 12,000 geologists in the Chinese Ministry of Geology, in addition to 11,000 technicians. A total of 270,000 employees are on the geological service roster. There are 14,000 geology students in ten educational institutions with 18,000 others in technicums. Because of the enlivened geological exploration programme, four more institutes are to be opened, pointing to a total enrolment of 30,000 students. Ultimately, each province and autonomous region will have a geology technicum with a total of 40,000 students.

All may not be as satisfactory as supposed, however, in the use of vast hordes of amateur prospectors, for Mr. Alexandrov finds:

"Although geological prospecting is performed in 'co-operation' with the people, the professional geologists seem not to be very enthusiastic about co-operating with these hundreds of thousands of 'volunteers'. This is vigorously rebuffed by the party and any criticism or opposition is qualified as a 'mystical point of view', 'dogmatism', 'rightist conservatism', and 'support of obsolete rules and limitations of the old system'. Western European and American theories and methods are traditionally criticized. In general, there is a certain feeling of anti-intellectualism in the attitude of the government despite the much advertised support of 'daring thinking, daring propositions, and daring actions'."

The article states that Communist China's inferred reserves of coal are estimated at 1,500,000,000,000 tons, a considerable part being represented by coking coal, 80 per cent of which is bituminous. Almost 30 per cent of Chinese territory is reported to have potential oil and gas bearing structures. Inferred reserves of iron ore are estimated at 100,000,000,000 tons. The indicated reserves of iron ore are figured at 6,000,000,000 tons. More than 200 tin deposits are known. Several new copper deposits have been reported. The numerous bauxite deposits have not yet been adequately explored.

The Soviet Union's Minister of Geology, P. Ya. Antropov, recently visited Communist China and reported substantial reserves of tungsten, molybdenum, antimony and phosphates, and, also, occurrences of economic value, of chromite, nickel, gold, beryllium, tantalum, columbium, rare earths, and asbestos.

MEXICO'S MINING PLANS

According to a recent statement by the Secretary of National Patrimony, Sr. Eduardo Bustamante, Mexico is now ready to establish a zinc refining plant with an annual capacity of 38,000 tonnes of zinc concentrate at Saltillo in Northern Quahila State. Plans for such a plant have been under consideration since 1958, when President Cortines started investigations into the possibility of establishing a plant in the state of Guanajuato.

Sr. Bustamante added that the Government was now considering plans for a second plant in Torreon or Zacatecas, with a view to encouraging small mines. The Minister said that this did not imply nationalization of the industry.

It was further disclosed that the Government also intended to establish further plants for refining other minerals. It hoped to do this by interesting private investors and persuading them to enter this field. "But if they are not willing to do it, then the Government will have to do it," added the Minister, who went on to state that President Lopez Mateos was sending a Mining Bill to Congress in September designed to "do away

with colonial systems in the mining industry" and giving the Government legal authority to regulate production and exports of minerals. The new Bill would force foreign mining companies operating in the country "to change their systems or leave Mexico," he declared.

One can only hope that in giving expression to these remarkable sentiments Sr. Bustamante was speaking in his private capacity and not on behalf of the Government. If there has indeed been exploitation, as presumably the reference to "colonial systems" is intended to imply, the boot is very firmly on the other foot, since mining has been the milk cow of successive Mexican Governments and has the unenviable reputation of being the most highly taxed mining industry in the world. If, as would also appear from the statement, the Mexican Government is desirous of encouraging private investment, it would be better advised to follow the examples of other countries which have sought to create a more favourable climate for enterprise, more especially by a radical change of fiscal policy. Otherwise, Mexico will continue to lag behind other countries in the development of the mineral resources with which it has been liberally endowed.

MALAYAN AGREEMENT WITH JAPAN

The Federation of Malaya is, by a most-favoured-nation trade agreement concluded with Japan on May 10, assured that there will be no diminution in her current proportion of iron-ore imported into Japan.

The Japanese Government also agreed to give sympathetic consideration to the taking of appropriate remedial measures should the import into Japan of dumped or subsidized tin from any third country affect or threaten to affect adversely the imports of tin from the Federation.

Hopes that Japan will join in any new International Tin Agreement that may be evolved at the U.N. conference on tin in New York are strengthened by the inclusion in the trade agreement of a declaration that there is an urgent need to find means of producing a greater degree of stability and predictability in international trade in primary products and that the two governments will give sympathetic consideration to international action designed to improve the conditions of international trade in primary products of direct interest to either country.

AUSTRALIA'S TAXATION CONCESSIONS

The Commonwealth Government has decided to continue the taxation concessions granted to the mining industry. The concession exempts from taxation 20 per cent of the profits earned by companies from certain prescribed minerals and also applies to dividends paid out of those profits. The minerals in question are all those of importance mined in the country, or likely to be mined, except lead, zinc, silver, cadmium, uranium, gold, coal and iron ore. Uranium and gold are completely exempted from income tax under a separate concession.

Previously, there had been a time limit, but this has now been lifted because it had caused some uncertainty as to whether or not the benefits granted would be available when the mining properties had been developed to the productive stage. It is expected that removal of this uncertainty will stimulate mineral exploration, and development will be encouraged.

In the last 17 years, the value of Australia's mineral production has increased by about £A200,000,000 and that of the mineral exports by about £A40,000,000. It is considered that the tax concessions have contributed substantially to this rapid development of the industry.

Magnesium — Its Progress

TWENTY years ago most of the world's magnesium was produced in Germany (20,000 tons out of a total world output of 32,000 tons); in 1959 world production at 92,000 tons was spread over eleven countries, with 45 per cent in the U.S.S.R., 30 per cent in the U.S. and 25 per cent in other parts of the world, mainly Europe.

The progress, prospects and uses of magnesium are surveyed in the following abstracts from papers presented by British and American metallurgists at the joint meeting of the Magnesium Association at the Magnesium Industry Council.

Dealing with "Commercial Applications of Magnesium Castings in the United Kingdom," John D. Pitman, A.M.I. Mech.E., of Sterling Metals Ltd., Nuneaton, said that there had been a steady widening in the field of application.

In heavy vehicle construction, magnesium was being used for sumps, worm castings, gear boxes, flywheel/clutch housings, selector housings, cylinder head covers, change speed covers and pump drive housings. One worm casing was still giving satisfactory service after covering half a million miles in 22 years. In the car industry, magnesium alloy was used for gearboxes, axle cases, axle ends and gearbox top covers for the Reliant three-wheelers and for an oil sump in the Wolseley car. The introduction of transfer machines associated with the fire bogy and ignorance of correct machining technique had militated against the use of magnesium, but efforts were being made to allay fears and more interest in magnesium was now being shown. Racing car design was controlled by formula, but magnesium was being used for sumps, clutch housings, differential housings, gearbox covers, bearing caps, rocker box and cam box covers and especially wheel rims, which latter use might extend to private car construction.

Probably outstanding in the use of magnesium in agriculture was the transmission case and gear box on the Ferguson tractor, while, in industry generally, one of the heaviest one-piece castings made in the U.K. was a pulley for a 25-ton Beché double hammer drop forge. Magnesium had also been chosen for certain portable machines and hand tools because of its lightness, strength and rigidity, together with ease of handling of the tool.

R. W. Eade and B. W. Peck, of J. Stone & Co. (Charlton) Ltd., London, spoke on "Magnesium Casting in the U.K.—Alloys and Production" and said that the successful introduction of the magnesium-zirconium alloys had greatly increased the number of alloys available to the designer and foundryman. The pattern of development in the U.K. differed from that in North America and interchange of opinion would be of benefit.

Magnesium casting alloys in general use fell into four groups: the magnesium-aluminium-zinc alloys in the as-cast, solution treated or full heat-treated condition; the high strength, magnesium-zirconium alloys, with the major alloying element zinc, and new variants of this alloy range with smaller additions of either rare-earth metals or thorium; the creep-resistant magnesium-zirconium alloys with the major alloying element either rare-earth metals or thorium; and a new range of alloys of magnesium-zirconium, with the addition of fractionated rare-earth metals and the possible addition of silver, which possess a combination of high room temperature properties and good creep resistance, thereby combining the qualities of the alloys in the second and third groups.

In a paper entitled "The Pellet Metallurgy of Magnesium", Dr. R. S. Busk, of the Dow Metal Products Co. Midland, U.S., said that the extrusion of relatively fine pellets of ZK60 into structural shapes had been a commercial process at his

company's Madison, Ill., plant for two years. The product, known as (P)ZK60B was made to the highest strength specifications of any Mg-base alloy regardless of process or form. The use of extrusion pellets was especially suited to magnesium-base alloys because of the sensitivity of the mechanical properties to grain size. Since low cost and high mechanical properties were inherent advantages of the process, it was expected that the use of pellets would continue to grow.

The Nuclear Field

E. F. Emley, Ph.D., F.I.M., F.R.I.C., chief metallurgist, Magnesium Elektron Ltd., Manchester, dealing with "The Place of Magnesium in the British Nuclear Power Programme," said that the principal use of magnesium in British reactors was to can the natural uranium rods to prevent the uranium from being oxidized by the CO₂ gas and to prevent radioactive products from contaminating the gas stream. Magnesium was better than other materials because it had little tendency to absorb neutrons; did not form an alloy with uranium; had adequate resistance to CO₂ up to the highest temperatures envisaged; and had reasonably high thermal conductivity. Its creep ductility and machining properties were also better than those of aluminium. Before magnesium was accepted as a potential constructional material for use at up to 450 deg. C. or so, however, its safety in respect of fire hazard had to be proved.

Dr. Emley said that, for canning alone, magnesium to the extent of about 600 t. bar or impact extrusion slug a year would probably be required by the U.K. nuclear field over the next two decades and there were three approved material suppliers. The most interesting technical problems had been the production of alloys in bar as free as possible from inclusions and residual extrusion defects.

This interesting field was also discussed in a paper presented by C. J. Smith, A.I.M., technical director, Birmetals Ltd., Birmingham, entitled "The Production of Magnesium Alloys to Nuclear Engineering Standards". Mr. Smith said that British reactor experience in the use of Magnox A12 alloy had confirmed its selection on the grounds of chemical stability and neutron transfer properties, but its mechanical properties might not meet varying conditions of long term usage in civil stations. The ductility of the alloy at temperatures of the order of 200 deg. C. such as occur in the cooler parts of the reactor might be somewhat suspect. Such deficiency in ductility could also be associated with the formation of intergranular cavities exposing the risk of premature failure. The possibility of using alternative magnesium-base alloys was, therefore, being examined.

In British research work attention was being given to such alloys as magnesium-manganese, magnesium-zirconium, magnesium-cerium-aluminium, magnesium-manganese-cerium, magnesium-manganese-zirconium and magnesium-zinc-zirconium. Some of these had also received attention abroad. Production by powder metallurgy was a possibility. The most favoured canning alloy would probably be one containing the grain growth inhibiting element zirconium, while binary alloy ZA containing a nominal 0.6 per cent Zr had strong claims to recognition.

The possibility of full scale production of such alloys to a sufficiently high standard quality must also be considered. To develop approved routes for the production of all vital components in the nuclear field close co-operation between all branches was essential.

Press and Prospects

At the invitation of the Magnesium Industry Council the spring meeting of the Magnesium Association of America was held in London from May 23-31, 1960. The Magnesium Association, founded in 1943, membership of which comprises the majority of American firms interested in magnesium and its alloys, and which now numbers over sixty, also includes thirteen companies established outside the U.S. The fact that an American organization should hold its annual meeting in a non-American country, emphasizes the international nature of the magnesium industry.

Developments in the United States

Three speakers from the United States dealt with the subject "Magnesium, a Material of the Space Age". J. H. Rizley, chief materials and process engineer, Convair Div., General Dynamics Corp., Pomona, Cal., dealing in part I with "Castings," said that, whereas the original federal specification for magnesium sand castings (designated QQ-M-56) covered the minimum mechanical requirements of only three alloys, the latest revision (QQ-M-56b) covered ten alloys. Hitherto magnesium had not been considered a structural alloy for use much above 300 deg. F. but present specifications contained minimum values at 500 deg. F. for three alloys, viz. EZ 33 A, HK 31 A and HZ 32 A, which could be used for short periods at temperatures as high as 900 deg. F.

The use of magnesium die castings for electronic packaging had continued to grow and in some electronic applications where heat sink capability and damping capacity had favoured magnesium, the fatigue life of such castings might also exceed that of other methods of fabrication.

Speaking in Part II, on "Forgings and Extrusions," D. R. Mathews, technical staff, Hughes Aircraft Co., Culver City, Cal., said that, although magnesium, the lightest structural metal, had been widely applied in high performance airborne vehicles and their internal electronic components, its broader use had often been restricted without reasonable evaluation on grounds of corrosion, inadequate fastening and joining techniques, difficult electrical grounding and decreased strength at elevated temperatures, and a new look was now necessary into its role in space age technology.

In astronautical applications magnesium offered many of the same advantages as in aeronautical applications, including low density, low cost and excellent machinability. The high damping qualities should be of greater importance where there was no air to dissipate structural vibration and the non-corrosive nature of the space environment should eliminate galvanic corrosion problems.

Because of the short duration of exposure to aerodynamic heating which occurred only on leaving and re-entering the atmosphere, the newer high temperature magnesium alloys could often be used on external surfaces of space vehicles. Thermal coatings could lead to even wider usage by lowering the effective surface temperature. Once a space vehicle had left the earth's atmosphere, the ordinary low temperature magnesium alloys generally had suitable properties.

The use of magnesium forgings and extrusions was given real impetus in 1951 by the Air Force Heavy Press Programme. At the end of World War II, the largest extrusion press in the U.S. was of 5,500 s. tons capacity. Several extrusion presses of about 13,000 s. tons capacity were now in operation in the U.S., while forging presses of 18,000, 35,000 and 50,000 s. tons capacity were available and the size and tonnage of magnesium

forgings and extrusions produced had increased greatly in the last decade.

Magnesium extrusions had been widely used in structures and parts for the Discoverer satellite, and the Bomarc, Polaris and Titan missiles. One third of the weight of the first four Discoverer satellites had been made up of magnesium-thorium alloys, including 20 types of extrusions. Magnesium extrusions had also been used in a portable landing mat to support heavy bombers.

The use of spherical 0.016 in. diameter pellets for extrusions resulted in extremely fine grain size and improvement in compressive yield strength, while a new zinc-rare earth alloy, ZE 62 (plus 0.45 Zr) showed signs of reaching 19.2 or 20.1 tsi (43,000 or 45,000 lb. p.s.i.) minimum yield strength, both tensile and compressive, which would place it on a par with the highest strength aluminium alloys on a strength-weight basis.

Wrought Alloys

On "Sheet Metal" (Part III), C. P. King, assistant supervisor, Materials and Process Section, The Marquardt Corp., Van Nuys, United States, said that whereas in Britain less than 10 per cent of magnesium usage was in the wrought form, in the U.S., more than 30 per cent consisted of wrought alloys. Many aircraft and missiles incorporated magnesium. For instance, the B-36 bomber contained 9,000 lb. of sheet AZ 31 covering more than 50 per cent of the exterior skin. Its successor, B-52, incorporated 1,400 lb. of AZ 31 sheet in a total weight of almost 2 tons of magnesium used. America's first intercontinental missile, the subsonic Snark, contained almost 1,500 lb. of sheet plus 3,000 lb. of castings. For supersonic missiles thorium was added to magnesium to give the HK 31 alloy and the Bomarc used 200 lb. of HK 31 sheet. In the Douglas Skyrocket the entire monocoque fuselage was magnesium while the Chance Vought Cutlass fighter, in which over 40 per cent of the skin was magnesium, contained 2,300 lb. of sheet, plate, castings and extrusions. The two-stage Titan missile contained over a ton of magnesium-thorium alloys, 40 per cent of the skin being magnesium sheet. Various resins were used for corrosion protection and anodized coatings against erosion.

The Sikorsky S55 helicopter used 1,120 lb. of magnesium in a total weight of 4,000 lb., while the S56 used 2,050 lb. magnesium out of 5,900 lb. total weight. In the S58, 5,558 lb. of magnesium alloys, representing 38 per cent of its empty weight, were used.

On the subject of "Magnesium Wrought Products in the United States—Military Applications", E. Howard Perkins, chairman of the board of directors, Brooks and Perkins, Inc., said that the current use of magnesium wrought products for all purposes in the U.S. was about 12,000 tons out of a total of 40,000 tons of magnesium used. After mentioning some of the advantages of magnesium as a structural material and its applications in U.S. military aeroplane and missile construction, Mr. Perkins went on to say that the Signal Corps had also used magnesium for cases and covers for field telephone sets and over 40,000 such cases and covers had already been made by one manufacturer.

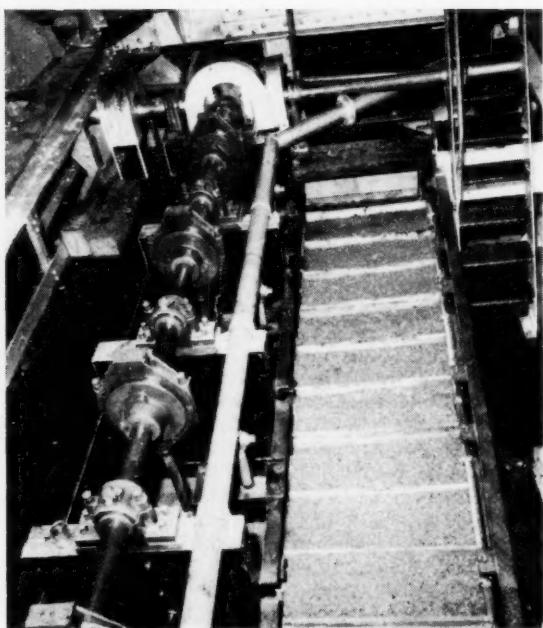
Another important military application was in platforms for carrying equipment up to 17,000 lb. in weight dropped by parachute. These platforms, made almost entirely of magnesium alloy, proved superior to other units made of high strength aluminium and weighing 20 per cent more. Magnesium had also been used in the production of the M-274 light weapons carrier, which, weighing only 900 lb., could carry a 1,000 lb. load plus driver.

There was also a growing interest in the use of magnesium-lithium alloys in various space programmes, based almost entirely on the reduction of specific gravity by adding lithium to magnesium to 13 per cent or more.

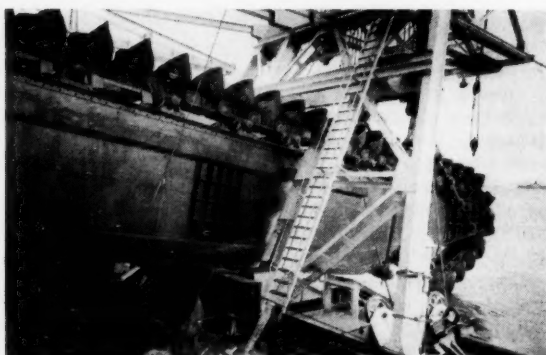


DREDGING FOR

Above is the new sea dredge completed and at the start of its tow to Bhuket. Below is a view of the new treatment plant jigs and drives aboard



Below, at left, the 167 ft. bucket ladder. At right, the bucket ladder hoist engine



THE new Sea Dredge of Tongkah Harbour Tin Dredging Ltd., a bucket dredge built specially for digging for tin on the sea bed, commenced commercial operations on February 1, 1960, at Bhuket, an island off the south-west coast of Thailand.

Tongkah Harbour Tin Dredging Ltd. was formed in 1938 to continue the enterprise—originally Australian sponsored—which first introduced the process of winning tin by bucket dredge when it began dredging operations in the harbour at Bhuket in 1907.

Need for a Deeper-Digging Dredge

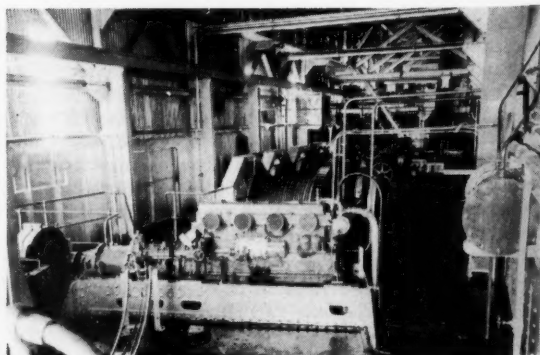
A few years ago the company found that its Bhuket dredge, which had been working in the sea since 1938, was reaching the end of its useful life. A survey showed that an overhaul was not practicable, whilst in addition the remaining reserves which the plant was capable of working were very limited. It was also recognized that a deeper-digging dredge would be needed for working other sea areas in the vicinity.

Plans were made for the design of a suitable unit, and the decision was taken by the company to purchase and rebuild a secondhand dredge.

The dredge finally chosen was one owned by Pattani Tin Ltd. which had been purchased new from Werf Conrad, of Haarlem, Holland, and erected in 1929 at Lamphya near Yala in South-East Thailand. It operated on the Pattani property until January, 1950, when dredging reserves were exhausted. It lay idle for several years as it was not an attractive proposition for prospective buyers because of its remote position in relation to road and rail communications.

Choosing and Preparing Reconstruction Site

Tongkah Harbour purchased the Pattani dredge from the liquidator of Pattani Tin Ltd. for £5,000 and at first planned



ING FOR TIN ON THE SEA BED

the redesign with diesel-electric drive in place of the original steam drive. This was later altered to all diesel drive. The redesign, which was started in 1956, provided for an increase in digging depth from 84 ft. to 100 ft., an increase in bucket capacity from 12 cu. ft. to 15 cu. ft., and an enlarged treatment plant to cope with the greater throughput.

After due consideration it was decided that as there was considerable work to be done in the fabrication of new parts, installation of diesel units and associated drives, the erection could more easily be undertaken on the seashore somewhere near Penang, Malaya. Another factor that weighed considerably in this decision was the lack of a suitable building site by the shore anywhere near Lamphya, coupled with the long tow necessary around the Malayan Peninsula to Bhuket.

Some time was spent in looking for a suitable site having (a) access to the open sea, (b) access by road to the Malayan railway system, (c) firm ground with water deep enough in which to launch the pontoon.

A site was eventually found which was a disused Public Works Department quarry at the mouth of the Juru River which enters the Penang Straits opposite the southern end of Penang. A great deal of site preparation was necessary and as rental for the quarry the company was asked to build 1.4 miles of first class road to replace the last section of the dirt road. The road building was carried out at considerable cost and this, together with the work found for the local fishermen and their dependants, enlivened the little fishing village.

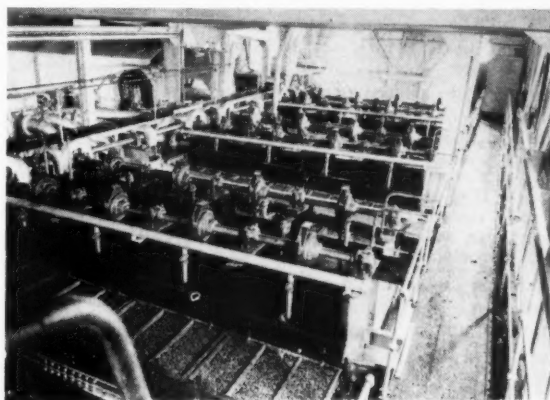
Work was started on the dismantling of the Pattani dredge at Lamphya in October, 1957, and the fabrication of shell plating, all of which is new, was commenced during December

This story of the redesign and reconstruction of an inland dredge specially for the mining of tin on the sea bed off the coast of an island in Thailand is reproduced from "Tin." Photographs are by courtesy of the Anglo-Oriental and General Investment

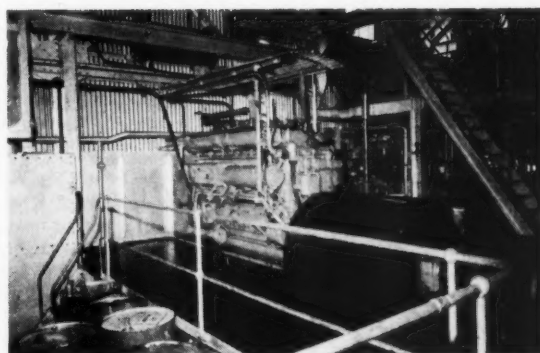
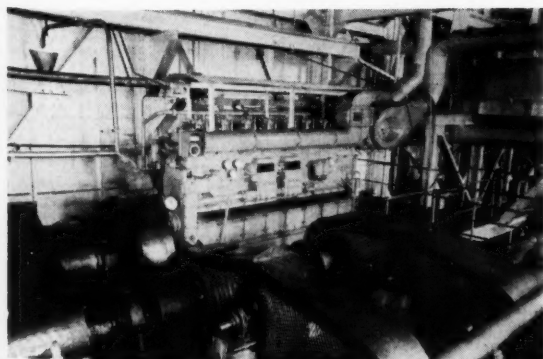
Trust Ltd.

of the same year. It is of interest to note that all structural alterations and additions were carried out on site at Juru. This included a complete new bucket ladder and the enlargement of the pontoon and superstructure.

A total of 1,338.5 tons of dismantled dredge was brought out of Thailand by rail which included all superstructure, pontoon framing, winches, gear units, jigs, etc.



Immediately below, the principal drive engine for operating pumps, screens, jigs, etc. At right, bottom of page, the bucket drive engine. At right, alongside, a further view of the treatment plant drives and jigs



Reconstruction and Tow to Thailand

The laying of the bottom plates commenced in March, 1958, and the pontoon was launched at the end of September in the same year. Erection of superstructure and the installation of winches and other mechanical units began immediately.

The enquiry for the supply of the diesel engines went out for tender and that submitted by Deutz, of Germany, was accepted. Most of the engines arrived at the building site during October, 1958, and their storage until they could be installed presented a problem. The installation of the engines started during May, 1959, and after all units had been tested under light load conditions the operation of pulling in the bucket ladder was commenced. Although this work had to be carried out over suitable tides it went smoothly.

The dredge was completed and ready for towing down the river channel through the mud banks at the end of November of last year and on the morning of December 1, two small tugs, the *Eel* and the *Sagai* and one larger tug, the *Mentakab* started to move the dredge from Juru village. After successfully negotiating the tortuous channel, the dredge was eventually secured to the Penang Port Commission North Buoy. This move took 6½ hours.

It was not until the evening of December 19 that the long tow to Bhuket started with two deep sea tugs *Inglis* and *Croaker* in attendance. The *Inglis* (850 h.p.) attached itself to the stern of the dredge and paid out 100 fathoms of 6 inch wire rope which was then connected to the chain bridle, and the *Croaker* (450 h.p.) went ahead of the *Inglis* by 50 fathoms, and assisted with the tow.

Bhuket was reached on the evening of December 21 at 7 o'clock and anchor was dropped for the night. By the next afternoon the dredge had been moved to the prepared moorings and all was set to start trial runs. The tow had taken 48 hours with an average speed of 4½ knots.

Stability in Rough Weather

The new sea dredge is designed to handle up to 300,000 cu. yds. of spoil per month of 600 working hours depending upon digging conditions, down to a depth of 100 ft. below water line, and has bunker fuel capacity for 2 weeks' operation.

It has a light displacement of 2,500 tons, the main dimensions of the pontoon being as follows: length 230 ft., breadth 72 ft., and depth at side 11 ft. 6 in. The mean freeboard is 4 ft. 6 in. and the pontoon alone weighs 850 tons.

The bucket ladder has a length of 167 ft. and weighs 145 tons supporting 117 15-cu. ft. manganese steel buckets each weighing 1½ tons. The buckets tip at the rate of 21 per minute and are linked together by 7 in. diameter nickel chrome steel pins.

The total installed horsepower is 1,404 developed by 8 diesel engines ranging from 8 h.p. at 1,600 r.p.m. to 700 h.p. at 500 r.p.m.

All jigs installed are of the Hartz type with beds 16 ft. × 3 ft. 6 in. wide and 12,000 gallons per minute of water is used for washing and screening.

The large pontoon provides a high degree of stability in rough weather, and the whole dredge apart from the fore deck is housed with galvanized corrugated iron sheeting with 2 ft. 6 in. mild steel coaming all round and with storm boards fitted in way of doors.

KOREA'S MINING PROGRAMME

GOLD occurs extensively in placer and vein deposits throughout Korea. In its recovered form the gold is immediately convertible into cash, and although few large deposits are being worked primarily for gold by mechanized methods, the production is substantial, averaging for the last 2 years slightly more than 2,000 kg. a year. During the first 9 months of 1959, gold output in Korea totalled 1,472 kg.

Of the more than 40 mines reported as operating during fiscal year 1959, only 13 mines reported production. Of these mines only two (Kubong-Chungchong Namdo and Muguk-Chungchong Pukdo) produced more than 20 kg.; however, these two mines accounted for about 56 per cent of the total output (1,200 kg. out of 2,114 kg).

Export of gold from Korea is prohibited by law and the Bank of Korea, in theory the only outlet for domestic production, pays the world price established by the International Monetary Fund at \$35 per ounce, or 17,500 hwan (500 hwan equals \$US 1.00). Most of the output is sold to private citizens in the form of jewelry or bullion in an attempt to prevent inflation or as a means of acquiring foreign bank accounts. On the Seoul black market, gold reportedly commands a price of 1,500 to 1,700 hwan per gram, or 46,650 to 52,870 hwan per ounce. Thus, the incentive for gold producers to bypass the Bank of Korea and sell on the open market is very great.

Control of the black market in gold is apparently high on the ROK Government's list as a means of coping with expected future reductions of foreign aid. It was one of four measures listed recently by Finance Minister Song In-sang as among those needed for Korea's economic security (the others are expanded exports, foreign investment, and tourism).

The Ministry of Commerce and Industry reported that the production of iron ore in Korea for the first 9 months of 1959

Mining progress in the Republic of Korea is reviewed in "Mineral Trade Notes, April 1960," and a summary is given of the production programme for the current year

totalled 225,613 tonnes. Output in 1958 was 261,025 tonnes, compared with 185,412 tonnes in 1957.

During 1959, the Daehan Iron Mining Co. property at Yangyang (Kangwon Do) was surveyed to determine the extent of the orebody, and as a result, approximately 2,000,000 tonnes of recoverable ore of medium grade (averaging 47.9 per cent Fe) was proved.

A modern tungsten processing plant, capable of processing tungsten middlings into high percentage scheelite at a rate of 5,000 tonnes a year has been completed in South Korea by Utah Construction Co. at a cost equivalent to £1,280,000. The plant will raise the percentage of tungsten content to 90-95 per cent from the previous 60 per cent. The plant is managed by the state-owned Korean Tungsten Co.

Production Plans for 1960

The Ministry of Commerce and Industry recently announced the following minerals production programme for 1960 (in tonnes unless otherwise stated):

	Planned 1960 production	Increase over 1959, percent
Gold (kg.)	250	17
Copper	12,600	255
Iron ore	300,000	5
Tungsten	5,000	70
Limestone	800,000	88
Graphite, amorphous	105,000	-
Coal, anthracite	5,027,600	23
Lead	3,000	591
Zinc	500	150

MINING MISCELLANY

The Timber Development Association in its 26th annual report states that there has been a considerable decrease in the use of timber in coal mines, due to such causes as the fall in production of deep mined coal, changing methods of cutting and extraction, the demand for new kinds of supports and structures at present available in competitive materials but not in wood. This trend away from timber is increasing as mechanization of coal mines is extended. The use of these other materials for roof supports is the product of research and development instituted by the industries concerned. A programme of research and development is therefore necessary and with this end in view it has been decided to appoint a mining engineer. The appointment will be for three years and will be supported by the Home Grown Timber Associations of England and Scotland, the Woodland Owners Associations of England and Scotland, and the Department of Scientific and Industrial Research.

The purpose of Chile's Decree No. 255 is to assist the coalmining companies, which are at present in a difficult financial position. For five years those companies which undertake development and modernization programmes approved by the Corporación de Fomento de la Producción will be exempt from payment of fourth category income tax in respect of those profits which are not distributed but retained for the extraction, prospecting, processing and distribution of coal. These funds may be capitalized at any time and distributed as free issues without payment of taxes. The companies will be allowed to make a yearly amortization in respect of the coal extracted, and will be exempt from paying sales taxes in respect of transport, loading and unloading charges, as well as import duties on machinery and equipment used exclusively for the coal industry.

The large tungsten deposits in San Luis Province, Argentina, are to be inspected by West German experts, in order to find a way of reducing production costs.

Frobisher Ltd., are at present examining the Eastern Queen mine in the Queen's district of Southern Rhodesia. The mine is on the same line of strike as the Barberton, and it is reported that the company has already dewatered it and is now developing to find out whether payable ore still remains to be won.

President Jorge Alessandri of Chile has urged Kennecott Copper Corporation and Anaconda Co., to increase their investment in Chile by \$250,000,000 in the next four years to help the country recover from recent devastating earthquakes. He rejected a proposal that heavier taxes be imposed on U.S. copper companies to help finance rehabilitation. In New York, Kennecott and Anaconda officials have indicated plans for expanding their copper mining facilities in Chile by a total far above \$250,000,000.

Surigao Consolidated Mining Co. has exported its first bulk shipment of zinc concentrates, consisting of 1,206 dry s.tons estimated to contain 1,225,906 lb. of zinc. The shipment, produced in the company's property in the Surigao province, Philippines, was part of some 15,000 tons sold to a U.S. buyer.

The establishment of a pilot plant to produce magnesium was approved at the sixth meeting of the executive council of the National Metallurgical Laboratory at Jamshedpur, India. The Laboratory has been producing magnesium from dolomite on a small scale.

The Czech Government has announced details of aid granted to the Polish mineral-mining industry. This includes credit granted for expanding Polish sulphur production, to be paid back by Poland within the third five-year plan period with sulphur totalling 360,000 tonnes. There is also a credit of 250,000,000 roubles for the expansion of hard coal production during 1963-70, for which Czechoslovakia will receive a guaranteed annual supply of 2,500,000 to 3,500,000 tonnes of Polish hard coal as from 25 years after granting the credit.

Dravo Corporation of Neville Island, Pa., has announced in Pittsburgh that it will supply roasting kilns to two pilot plants being constructed on the western section of the Mesabi Range to determine the economic practicality of commercially processing semi-taconite iron ore. Previously these deposits, believed to total several billion tons, were considered unprofitable. Dravo is to supply two small pilot plants with kilns in which crushed semi-taconite will be converted from a non-magnetic form to a synthetic magnetite or magnetic ore. M. A. Hanna Co., will have a unit at Cooley, Minn., with an hourly capacity of 10 tons, and Oliver Mining division of U.S. Steel Corp., will provide a two-ton-an-hour facility at Coleraine, Minn.

Czechoslovakia imported a total of 6,384,637 tonnes of iron ore in 1959, compared with 1,824,000 tonnes in 1958.

The Egyptian province of the United Arab Republic at present imports 94 per cent of total unprocessed iron imports and 64 per cent of total coal imports from the Communist bloc, according to a report issued in Prague. The Communist countries buy 25 per cent of all Indian iron ore exports and 25 per cent of all Brazilian iron ore exports; they supply 70 per cent of India's total imports of unprocessed iron and 63 per cent of its imports of carborundum.

The Soviet Union is reported to be planning the erection of a plant of an annual capacity of 100,000 tonnes of steel at Tjilegon, in western Java. The plant would need a credit of \$U.S. 100,000,000.

The Luxembourg ore minerals concern Acieries Reunies de Burbach-Eich-Dudelage (ARBED) has purchased a hill containing quantities of iron ore from the town authorities of Esch-Alzette in a land exchange. Opencast mining on the hill, known as Galgenberg, will not start until the year 2,000. Ore exploitation on another hill owned by ARBED, the so-called Lallinger Berg, is to commence in 1965.

About 60 per cent of total world output of aluminium, or some 2,200,000 tonnes annually, is now produced with the Soderberg anodes of the Norwegian Elektrokemisk concern, it is announced from Oslo. World capacity of the ELKEM furnaces, used for the smelting of ferro-alloys, calcium carbide, pig iron, copper matter, ferromanganese, etc., and also a product of Elektrokemisk, is given as almost 4,000,000 kW. a year.

Mr. Sardar Swaran Singh, Indian Minister for Steel, Fuel and Mining, stated at a recent meeting of the Geological, Mining and Metallurgical Society of India in New Delhi that the country's iron ore reserves at present totalled between 16,000,000,000 and 18,000,000,000 tons with an iron content of 60 per cent; almost all of these reserves were exploitable, though until now Indian iron ore was kept back by transport and sales difficulties. At present an annual national output of 12,000,000 tons was expected, but this would be increased to 34,000,000 tons by the end of India's third five-year plan, and low-percentage ores would be more economically worked.

The Belgian Congo Government recently announced the discovery and survey of large deposits of carbonatite containing commercially interesting quantities of pyrochlore and apatite, at Lueshe, 60 km. north of Lake Kivu, in the volcanic hills near Parc Albert. The SOMIKUBI mining company which has been surveying the area, has a 50-year renewable lease on the site.

The U.S. Senate has passed and sent to the House of Representatives a Bill to subsidize production of tin in the State of Alaska. The Bill is expected to be strongly opposed, on the grounds that the authorized prices (\$1.40 and \$1.25 per lb.) are above current market prices, and that current supplies and the U.S. stockpile are fully adequate. It is predicted that, should the House accept the measure, it would be vetoed by the President.

At the request of the Ecuador Government, the Japanese Overseas Mineral Resources Development Co-operation Association, an organization of leading mining firms, is to send a team of four experts for four months to survey Ecuador's mineral resources. The mission is to explore possibilities of exploiting zinc, mercury, copper, lead, antimony and iron ore resources in Ecuador for shipment to Japan as raw materials.

Metals and Minerals

Consumption of Antimony Rises

A continuing rise in the consumption of antimony is indicated by the latest statistics from both Britain and the U.S. In Britain consumption of new metal in the first quarter of 1960 totalled 1,504 tons, which compares with 1,110 in the first quarter of 1959 and with 4,923 tons in all last year. In March this year consumption amounted to 569 tons against 503 tons in February and 432 in January.

Across the Atlantic the Bureau of Mines, U.S. Department of the Interior, reports that in the first quarter of 1960 consumers' use of antimony was 2 per cent higher than the average quarterly consumption in 1959, amounting to 3,401 s.tons (antimony content). For the whole of 1959 industrial consumption totalled 13,317 tons.

Imports of 3,700 tons of primary antimony in the first quarter of 1960 were the highest in more than two years. Ore and concentrate, mostly from the Union of South Africa, Mexico and Bolivia, accounted for 52 per cent of the total. The chief suppliers of antimony metal, accounting for 36 per cent of total imports, were Yugoslavia and the U.K.

U.S. consumers' and dealers' stocks of antimony have shown a downward trend since 1944, when inventories totalled 13,500 s.tons. On March 31, 1960, industry stocks at 6,721 s.tons were 6 per cent under those of December 31, 1959. Most of the long-range decline, as well as the decrease in the first quarter of this year, was in ore and concentrates and metal.

Mr. S. G. Menell, chairman of Consolidated Murchison (Transvaal) Goldfields and Development Co. Ltd., in his review of 1959, stated that the demand for antimony clobbered ore and concentrates showed a further increase and that there was a ready sale for the year's production. During the latter half of the year the mine operated at full capacity, the tonnage mined being drawn entirely from the Gravelotte section, where development continues to be well ahead of mill requirements. For the past ten years this section has been the company's principal source of ore. Though by no means exhausted it has a limited life. The exploration programme has therefore been intensified and further expansion is planned for the current and future years.

WOLFRAM EDGING HIGHER

Wolfram ore shipment prices have gained still further ground in the past week and London quotations are currently ranging from 158s. 6d. to 163s. 6d. per ton c.i.f. Europe. Business has been less brisk than it had been earlier in the month, and buying interest is reported to be emanating mainly from the Continent.

High purity tungsten is the subject of a new Bureau of Mines bibliography released by the U.S. Department of the Interior. Difficulty in fabrication, arising from high hot strength and room tem-

perature brittleness, has presented one of the major obstacles to its wider use. However, increasingly higher temperatures are being encountered in the missile and space programmes, and the Bureau believes tungsten and its alloys to be the only metals capable of operating at "truly high temperatures" above 2,500 deg. F. Tungsten's melting point is 6,170 deg. F. Information Circular 7953, "Bibliography of High-Purity Tungsten, January, 1911, through February, 1959," is obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D.C., at 35 c. a copy.

U.S. TITANIUM OUTPUT RISES

Titanium metal producers in the U.S. are operating at levels higher than those of a year ago, despite expectations of a downward trend in 1960. This performance is in marked contrast with that of some major segments of industry, notably steel, which have failed to match the over- sanguine expectations with which the year began.

According to the U.S. Census Bureau, 1,939,515 lb. of titanium mill products were produced in January-March, 1960, being an increase of 16 per cent over the 1,669,037 lb. produced in the corre-

sponding period of 1959. Thus the industry, so far, has managed to confound the prediction of U.S. Business and Defence Service Administration officials that the 1960 mill product would drop to 5,200,000 lb. from last year's figure of 6,400,000. This forecast assumed some tapering off in demand from the B-52 bomber programme as engines and airframes on order were completed.

Despite this relatively satisfactory showing, the first quarter's results fall far short of the level achieved in 1957, when mill product output in the first quarter reached 4,500,000 and the record total of 11,300,000 lb. was produced during the year. U.S. facilities for sponge production have been running at only about 20 per cent of industry capacity, while it has been estimated that the value of titanium sales this year will be somewhere between \$50,000,000 and \$60,000,000, as compared with more than \$100,000,000 in 1957.

Statistics released by the Bureau of Mines, U.S. Department of the Interior, indicate that activity in the first quarter of 1960 was about equal to the average quarterly rate during 1959. Production of titanium metal was 977 s.tons, which compares with 1,205 in the first quarter of 1959, 1,449 in the second quarter, 724 in the third quarter and 520 in the fourth quarter. Imports, however, rose in the first quarter of this year to 962 tons, being substantially higher than in any quarter of last year. Consumption totalled 947 s.tons.

Ingot production averaged 1,493 s.tons in January-March this year, as compared with 2,171 in the second quarter of last

LONDON METAL AND ORE PRICES, JUNE 16, 1960

METAL PRICES

Aluminium, 99.5%, £186 per ton	Magnesium, 2s. 2½d./2s. 3d. lb.
Antimony—	Manganese Metal (96%/98%) £275/£28:
English (99%) delivered, 10 cwt. and over £190	Nickel, 99.5% (home trade) £600 per ton
per ton	Osmium, £22/£24 oz. nom.
Arsenic, £400 per ton	Osmiridium, nom.
Bismuth (min. 1 ton lots) 16s. lb. nom.	Palladium, imported, £8 12s. 6d.
Cadmium 10s. 6d. lb.	Platinum U.K. and Empire Refined £30 5s.
Cerium (99%) net, £15 0s. lb. delivered U.K.	Imported £28½/28¾
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.	Quicksilver, £70½/£70½ ex-warehouse
Cobalt, 12s. lb.	Rhodium, £45/£48 oz.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram	Ruthenium, £16/£18 oz. nom.
Gold, 250s. 4½d.	Selenium, 50s. 0d. per lb.
Iridium, £23/£26½ oz. nom.	Silver, 79½d. f. oz. spot and 79d. f'd
Lanthanum (98%/99%) 15s. per gram.	Tellurium, 25s. 0d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis	20s. 0d./21s. 0d. per unit, c.i.f.
Beryl (min. 10 per cent BeO)	210s./220s. per l. ton unit BeO
Bismuth	30% 5s. 0d. lb. c.i.f.
Chromite Ore—	20% 3s. 3d. lb. c.i.f.
Rhodesian Metallurgical (semifabable 48%) (Ratio 3 : 1)	£15 5s. 0d. per ton c.i.f.
Hard Lumpy 45%	£15 10s. 0d. per ton c.i.f.
Refractory 40%	£11 0s. 0d. per ton c.i.f.
Small 44%	£13 5s. 0d. per ton c.i.f.
Baluchistan 48%	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10 : 1)	Nb ₂ O ₅ : Ta ₂ O ₅ 175s./180s. per l. ton unit c.i.f.
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF ₂)	156s. 0d. ex. works
Lithium Ore—	
Petalite min. 34% Li ₂ O	47s. 6d./52s. 6d. per unit f.o.b. Beira
Lepidolite min. 31% Li ₂ O	47s. 6d./52s. 6d. per unit f.o.b. Beira
Amblygonite basis 7% Li ₂ O	75s/85s. per ton f.o.b. Beira
Magnetite, ground calcined	£28 0s./£30 0s. d/d
Magnetite Raw (ground)	£21 0s./£23 0s. d/d
Manganese Ore Indian—	
Europe (46%-48%) basis 67s. 6d. freight	73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)	69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)	nom.
Molybdenite (85%) basis	8s. 11d. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO ₂ (prompt delivery)	£28 0s. 0d. per ton c.i.f. Aust'n.
Ilmenite 50/52% TiO ₂	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	158s. 6d./163s. 6d. per unit c.i.f.
Vanadium—	
Fused oxide 95% V ₂ O ₅	8s./8s. 11d. per lb. V ₂ O ₅ c.i.f.
Zircon Sand (Australian) 65-66% ZrO ₂	£16/£16 10s. ton c.i.f.

year, 842 tons in the third quarter, and 1,162 in the final quarter. Consumption averaged 1,430 tons in January-March this year, after falling from 2,129 in the second quarter to 591 in the third quarter of last year and recovering to 1,504 tons in the final quarter.

On February 16 this year rutile, which is used in making titanium tetrachloride, was transferred from Group II to Group I of the list of strategic and critical materials for stockpiling.

★

An agreement to develop applications for titanium diboride in the aluminium industry has been reached by American Potash and Chemical Corp., of Los Angeles, and Firth Sterling, Inc., of Pittsburgh. Titanium diboride and its alloys have good corrosion-resistant properties and possess electrical characteristics which offer significant economic advantages, particularly as cathodes in aluminium reduction lines.

★

The Australian rutile shipment market continues to jog along without any material change in prices. Minimum 95 per cent ore continues to be quoted at about £28 per 1 ton c.i.f., while South African material remains in the region of £27. Sellers are inclined to hold back for the time being. Not only are current levels unattractive, but there has also been a tendency to await the outcome of the Australian Mineral Sands Producers' Conference scheduled to take place last week.

INDIAN MICA EXPORTS

Inaugurating the Mica Sub-Committee meeting held recently in Jaipur, the Chief Minister of Rajasthan, Mr.

Mohanlal Sukhadia, stated that last year exports of Indian mica reached a value of Rs. 107,000,000, the highest figure achieved since 1952. The Minister added, however, that many foreign countries were trying to enter into serious competition with India, while continuous research was going on to replace the mineral by other substitutes and synthetic products. Mr. Sukhadia also said that steady output of good quality mica was being obtained from the mines, which were located chiefly in Bihar, Rajasthan and Andhra, but continuous efforts were necessary to discover new deposits.

At the third annual general meeting of the Mica Export Production Council of India, held in Calcutta, it was stated that the export trade suffered from lack of organization, with the result that foreign buyers took advantage of the rivalry among exporters. The lack of standardized samples for the foreign market and the continuance of consignment sales also contributed to the slow progress of the export trade.

Mr. S. K. Sen, Joint Chief Controller of Imports and Exports, who presided over the meeting, said that the Council was trying to bring all exporters and miners under one organization. So far, 42 exporters and miners had registered with the Council and had agreed to abide by its rules.

JAMAICAN BAUXITE FOR U.S.

Prime Minister Norman Manley has announced that the U.S. Government is to resume large-scale bauxite buying from Jamaica for military reserves. He expressed the hope that this decision would permit a raising of the island's bauxite output by about 1,000,000 tons annually.

TIN PRICE GOES AHEAD

Tin quotations, particularly the nearby position, have made further headway in the absence of buffer pool operations. Outside demand has been satisfactory both from the U.S., where the tinplate industry especially has been buying in greater volume, and from the Continent—particularly from Holland in view of the cessation of supplies from Indonesia and from Belgium where again the possible interruption in supplies from the Congo cannot be overlooked.

The United Nations meeting, which is being held in New York to discuss the proposed draft of a new International Tin Agreement, is holding its meetings in closed sessions and these are likely to go on through this month.

U.K. stocks in official warehouses increased last week 160 tons to 8,603 tons.

On Thursday the Eastern price was equivalent to £788½ per ton c.i.f. Europe.

LEAD AND ZINC EASIER

Lead and zinc prices in London have been depressed—in the case of lead by the actual selling of metal for nearby arrival and in the case of zinc, by the possibility that further shipments from Gulf ports will find their way to London.

In both cases consumer interest is well maintained but in spite of this the selling of lead against the mid-month settlement has been on a sufficiently large scale to widen the contango. These sales are generally believed to represent material of Spanish origin and little credence is placed in reports of substantial sales of Russian metal in this country which, not being a registered brand, is not deliverable against the L.M.E. contract.

The zinc market has also been held in check by the U.S. figures for May which, in spite of a decrease in production from 83,221 tons in April to 79,216 tons, resulted in a substantial increase in stocks to 165,038 tons against 147,861 tons at the end of April. Shipments were down to 62,039 tons against 71,926 tons a month earlier.

The two strikes in Idaho, namely against the Bunker Hill Co. and the American Smelting and Refining Co. at their lead/zinc properties, continue and no negotiations are scheduled at the present time.

Closing prices are as follows:

	June 9		June 16	
	Buyers	Sellers	Buyers	Sellers
COPPER				
Cash	£245	£245½	£251½	£252
Three months ..	£240½	£241	£245½	£246
Settlement ..		£245½		£252
Week's turnover		7,375 tons		11,725 tons
LEAD				
Current ½ month	£74	£74½	£73½	£73½
Three months ..	£74½	£74½	£73½	£73½
Week's turnover		4,975 tons		6,900 tons
TIN				
Cash	£790	£790½	£797	£797½
Three months ..	£789½	£790	£789	£790
Settlement ..		£790½		£797½
Week's turnover		565 tons		755 tons
ZINC				
Current ½ month	£89½	£90½	£90	£90½
Three months ..	£90	£90½	£90	£90½
Week's turnover		3,925 tons		3,475 tons

COPPER • TIN • LEAD • ZINC

(From Our London Metal Exchange Correspondent)

Certain outside factors have made their influence felt on the market during the week. After being inclined easier at the end of last week, copper values have rallied sharply whilst in the case of tin the nearby position in particular has shown some improvement. Lead and zinc, on the other hand, have both failed to maintain their recent levels.

CONGO POLITICS MAIN COPPER INFLUENCE

Sentiment in the copper market has undergone a marked change in the past few days. From the point where emphasis was being laid on quiet consumer interest on the Continent and the general lack of new business in the U.S., as well as on easiness in futures on the possibility that the customs smelters would be unable to maintain their price at 33 c., opinion has hardened in consideration of the potential seriousness of the situation in the Belgian Congo and the effect which any interruption in supplies would have particularly in Europe, after independence is granted at the end of this month.

In consideration of this, buyers in London were faced with general reluctance on the part of sellers to operate and at the same time there was some improvement in demand for electro from the Continent. A firmer tendency in London was accompanied by some increase in the backwardation, which under the circumstances was only to be expected as U.K. stocks in official warehouses only increased 81 tons to 3,363 tons.

Whilst earlier in the week U.S. customs smelters reported slow consumer buying, the price has been maintained on the strength of their previous export orders resulting in a satisfactory sales position for this month and next, and dealers found an appreciable increase in both domestic and export business when the state of emergency in the Katanga was announced together with an increase in the Belgian copper price from B.frs. 32.75 per kilo to B.frs. 33.75. U.S. producers at 33 c. are well satisfied with their July sales but these are unlikely to reach June's figure in view of works closing down for holidays.

Loraine Holes Through

On Thursday of last week a long-awaited event took place in the Riebeeck section of the Loraine G. M. property. This was the holing through of the 52 level haulage connecting the old No. 2 and new No. 3 shafts.

Loraine's 52 haulage system has been one of the major mining feats of late. Consisting of twin tunnels, each 10 ft. wide and 12 ft. high it is 21,000 ft. long at a depth from surface of approximately a mile. It has been steadily advanced at an average of about 1,000 ft. a month to be finished off six months ahead of the original schedule, under anything but easy circumstances.

Everything had to be handled through No. 2 shaft on the original Loraine property, which also had to handle normal mining operations on the Basal and "B" reef in this area, as well as limited development work on the northern section of the Elsburg reefs. One of the main problems was the allocation of available air for the various tasks and the solution of this is a credit to the mine management.

Simultaneously with the advancing of the haulage, the No. 3 circular shaft was being sunk. This has a lined diameter of 26 ft. and is rather unusual in that it has a

concrete brattice wall throughout its total depth of 5,851 ft. to provide upcast and downcast ventilation. Full-scale sinking started in September 1957 and it was completed in April 1960. From then a station was cut for the 52 level haulage.

The 52 haulage system lies in the footwall of the Elsburg reefs to the west of where they curve sharply upwards against the boulder beds. The No. 3 shaft is sited to the east of this contact in order that the minimum of payable ore is locked up in the shaft pillar.

With the holing through, development on the Elsburg reefs in the southern section of the property will get under way within a week or so. Reef raises will be put through from the 52 level to the 50 level, which is being advanced at high speed from the No. 3 shaft to provide stope faces. These should provide ore for the mill before the end of the year. In addition, development is to start on the 54 and 56 levels north of the shaft and work begun on opening the area south of the shaft between the 44 and 56 levels south of the shaft. With the improved ventilation now available an increased tempo of development will be possible at various points along the 21,000-ft. of reef

LONDON MARKET HIGHLIGHTS

The state of South African gold shares during the past week can only be described as depressing. Admittedly there was no heavy selling, but equally, buyers were very few. Even the Cape began to lose interest and was inclined to offer stock on Wednesday. Further racial disturbances in the Union were part of the reason, and confidence in Africa generally has, for the moment, been further weakened by Press reports suggesting mounting internal political difficulties in the Congo as independence day approaches. Such difficulties were to be expected, however, and it should not be assumed from this that there is any evidence of the eventual failure of Belgium's Congo policy.

The steady drift in prices persisted each day with the result that by mid-week the F.T. Gold Index had fallen nearly two points below its previous low of 65.5—established three years ago. This is the lowest point reached since the Index was compiled at 100 in September, 1955.

Most stocks slid down to their lowest for the year. Western Holdings dropped 6s. 3d. to 108s. 9d. and Ofsets came back 3s. 9d. to 68s. 9d. The last of the June half-yearly batches of Kaffir dividends had scant effect on such an unresponsive market. Even the very satisfactory increase from West Drie did no more than momentarily steady the price which later resumed its fall of 5s. to 75s. on the week. The higher payment from West Wits seemed to be completely ignored and the shares fell to 51s. 3d. along with the general decline. In the Diamond group De Beers met with occasional Continental selling and slid back 7s. to 136s. 9d.

The Copper section was, naturally

enough, completely dominated by Congo politics and the fear that trouble might spread to the Copperbelt. But here again actual selling was never anything like as large as the fall in prices suggested. Chartered fell 4s. 3d. to 76s. 9d. and Bancroft dropped to 16s. 3d. compared with a high earlier this year of 28s. 6d. Other losses were usually less severe.

Even the tin share market began to look a little uncertain, as after the prolonged rise in many share prices a little profit taking here and there was considered worth while. As a result Sungei Besi which had risen from 21s. to 34s. 6d. at one time this year reacted 2s. 6d. to 29s. 6d. and Ayer Hitam retreated from above the £5 mark to 98s. 9d. Singapore, however, remained a persistent buyer of Hongkong (12s. 7½d.) and Siamese (16s. 9d.).

Rejection of the Bisichi bid — of two Bisichi shares and 7s. 6d. for every three Jantar — by the Jantar board, and its consequential withdrawal had comparatively little effect on Jantar shares which lost only 6d. to 6s. 6d. while Bisichi eased 1½d. to 6s. 1½d. A later offer, that of Tronoh for the shares of Southern Tronoh, had a marked effect on the respective share prices. The offer was of one Tronoh share and 5s. cash for every two Southern Tronoh and Southern Tronoh jumped 2s. to 21s. 3d. while Tronoh moved down 1s. 9d. to 38s.

Lead-zinc shares wavered uncertainly for a while before deciding to ease. Consolidated Zinc came back 2s. to 79s. 6d.; because of its many U.K. chemical and metallurgical interests the shares of this company tend to be swayed by the course of Industrials, which became decidedly dull as the week wore on.

strike on which crosscuts and fan drilling have produced such tantalizing indications over the past 18 months.

When the No. 3 shaft is fully commissioned the total hoisting capacity will be around 160,000 tons a month. The present milling rate is 82,000 tons a month.

The total weight of rock excavated in the haulage system since the start of operations in September 1958 has been 433,000 tons, and in the best month, March this year, the total advance of 1,399 ft. in the main haulage and 1,296 ft. in the companion airway, plus 237 ft. in crosscuts and service bays, the weight was 30,000 tons.

On the ventilation side the main fan on 52 level circulated 130,000 c.f.m., equivalent to 185,000 tons a month. Air supplied to the tunnels was 70,000 c.f.m., or 105,000 tons a month; and air blown to the faces of ends was 27,000 c.f.m., or 40,000 tons a month.

The actual holing through was an impressive performance. Three ends were blasted simultaneously, and a clean accurate holing was achieved on each through to the No. 3 shaft station.

KAFFIR DIVIDEND SEASON

Like the early dividends declared last week, the remaining summer declarations from the West, Central and East Rand and Klerksdorp gold producers turned out to be singularly undistinguished. The only really bright spot was West Driefontein, which declared a dividend of 2s. 7½d. Allowing for the intervening scrip issue, this sustains the good advances recorded by this company.

A complete list of dividends is given below, together with the three preceding payments for comparison.

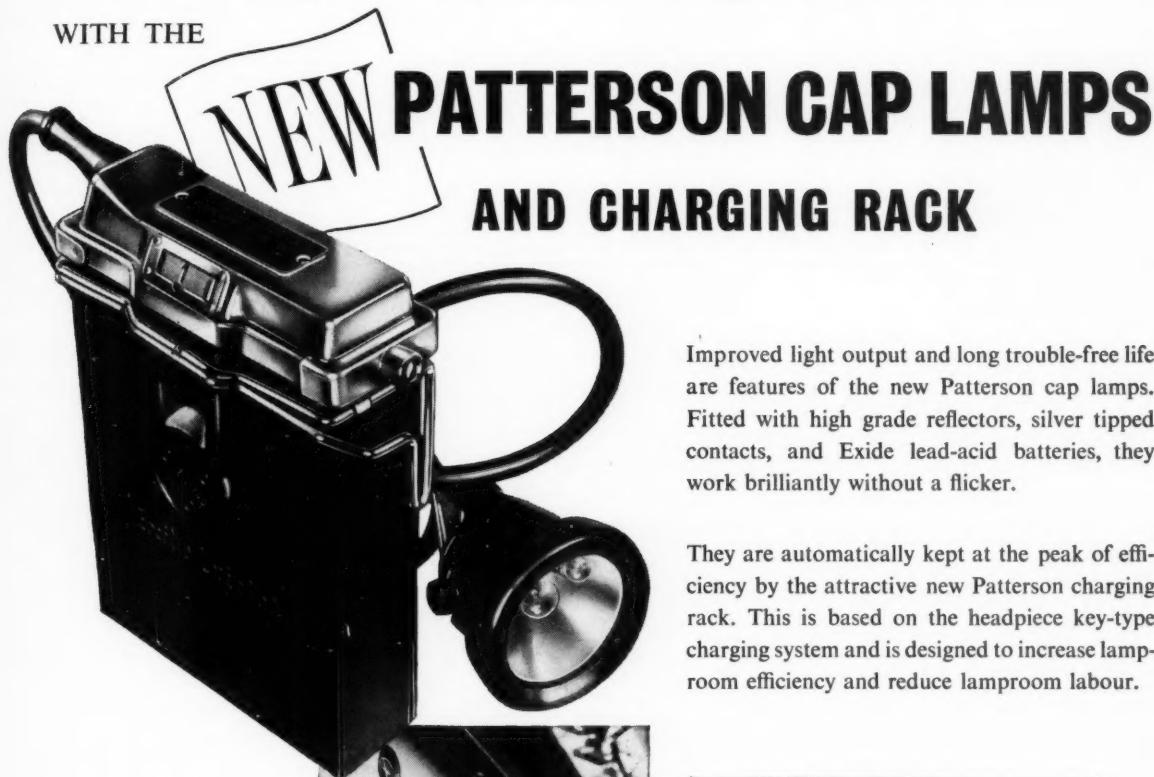
Company	Dec. 1958	June 1959	Dec. 1959	June 1960
	s. d.	s. d.	s. d.	s. d.
Anglo American				
Daggafontein	2 6 2 3	2 3 2 0		
E. Dagga	7½	7½	7½	7½
S.A. Lands	1 6 1 3		6 6	
Vaal Reefs	2 0 1 6	2 0 1 6		
W. Reefs	1 3 1 3	1 3 1 3		
Anglo-Transvaal				
Hartebeest	3 6 3 6	3 0 3 0		
Central Mining				
Blyvooruitz't	1 0 1 1	1 2 1 3		
City Deep	6 7½	7½	7½	7½
Cons. M.R.	1 6 1 6	1 3 1 6		
Crown	1 9 1 9	2 0 2 0		
Durban	1 6 1 6	1 6 1 6		
E.R.P.M.	2 0 1 9	1 9 1 9		
Modder E.	6 6	6 6		
Cons. Gold Fields				
Dominion R.	1 6 1 6	1 6 1 6		
Doornfontein	1 6 1 6	1 6 1 6		
Libanon	3½	3½	3½	4½
Luipaards V.	1 0 1 0	1 0 1 0		
Venterspost	10½	10½	10½	10
Vlakfontein	1 0	11 1 0	11	
W. Drief'n	*2 0 *2	1½*2	4½ 2 7½	
General Mining				
Buffels	1 6 1 6	1 9 1 10½		
Stil'n	1 10½	1 10½	1 7½ 1 6	
W. Rand Con.	2 3 2 0	2 3 2 0		
Johnnies				
Randfontein	2 3 1 9	2 3 1 3		
Union Corp.				
E. Geduld	1 11 1 9	1 11 1 8		
Geduld Pty.	6 3 4 9	5 0 3 4		
Grootvlei	1 3 1 1	1 5 1 1		
Marievale	1 5 1 4	1 7 1 6		
Others				
Wit. Nigel	1½	1½	1½	1½

* Adjusted for intervening scrip issue.

(Continued Overleaf)

Better lamps—better lamprooms

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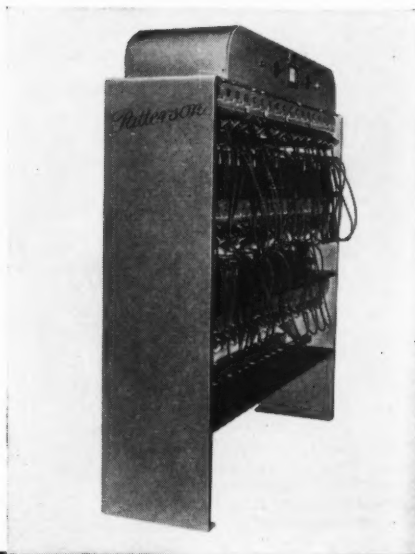


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BROKEN HILL MINES AGREEMENT

It has been announced that finality has been reached in the long protracted discussions over the renewal of the industrial agreement between the mining companies and the unions. The issue has now been decided by the president of the New South Wales Industrial Commission, who has given his decision on the outstanding contentious point.

This decision is that the lead bonus will remain as it is in the 1956 Agreement, but the Combined Executives are to negotiate if the companies are, at any time, in financial difficulties through the lower price of metals. The companies submitted that, although the bonus scale should remain as in the 1956 agreement, either party could give one month's notice of the termination of the agreement if the price on which the lead bonus is based falls below £85 Australian per ton or rises to £150 Australian for a period of one calendar month in either case. This latter submission was disallowed.

VENTURES OFFER FOR FROBISHER—EX OIL

As was recently forecast in these columns, Ventures, the big Canadian finance and exploration concern, has made an offer for Frobisher, which was originally floated by Ventures and has since pursued a parallel course.

The offer takes a rather unusual form. Ventures will make available to Frobisher 335,995 fully paid Ventures shares, and will assume Frobisher's liabilities. In return, Frobisher will transfer to Ventures all its assets, with the exception of the important oil concessions in Africa, together with \$250,000 which Frobisher will retain as working capital for that project. Frobisher will then distribute the Ventures shares to its stockholders in the ratio of one Ventures for 13 Frobisher — this proportion expressing more or less closely the relationship between the break-up values of the two companies.

The final picture, therefore, will be that an owner of 13 "old" Frobisher shares will, if the arrangement is ratified, own 1 Ventures share, and in addition, 13 "new" Frobisher shares, which will represent an interest in the oil exploration project which is perhaps the most important of Frobisher's operations at the moment. Certainly this scheme seems an admirable one, and it should meet with approval at the ratification meeting scheduled for June 24 in Toronto.

THE ASSET POSITION AT MASON AND BARRY

Mason and Barry's property at Mina de San Domingos is an old mine. In all probability its life, under present conditions, may not be longer than six or seven years. In a situation like this a company's asset position becomes of increasing importance. In the case of Mason and Barry, the situation is complicated by the fact that substantial writing-down during the company's sixty-eight years of existence have reduced the assets to a figure well below their true worth.

A further complication, too, is that the value of the assets as part of a going concern is considerably more than that calculated on a break-up basis. The town of Mina de S. Domingos itself is virtually entirely company property, including even the

church and Post Office. To put a value on such items without taking a view on the prospects for the company, the only sizeable industry in the area, is obviously impossible.

For this reason, among others, Mason and Barry has instituted a programme of diamond drilling to evaluate the potential of the Mina de S. Domingos area. This is to be an intensive drive, and the result will be that within the short space of one year it should be possible to determine whether the company has a mining future in this area and, in so doing, to make possible a realistic appraisal of the asset position.

Meanwhile Mason and Barry is continuing its efforts to decrease the dependence on mining of the area in which its property lies. Eucalyptus planting is progressing at the rate of 200,000 seedlings per annum, with the object of setting up a pulp or hardboard mill. Water supplies are being investigated, and the head of the Portuguese Forestry Commission is acting as the company's consultant. In addition, the possibility of developing the tourist industry of the nearby Algarvian coast is being actively investigated.

PROSPECTING AT MOUNT MORGAN

An Authority to Prospect has been granted to Consolidated Zinc covering about 440 sq. miles in the vicinity of Mount Morgan at Rockhampton. There is a long established mineralized area in that locality which appears to deserve closer investigation and this will be done as part of Consolidated Zinc's exploratory activity in the search for new sources of metals.

The investigation will be made by Consolidated Zinc in association with Mount Morgan, which company will contribute its knowledge and experience of the area.

INVESTOR'S CHRONICLE CENTENARY

On June 9, 1860 there appeared in the City Vol. 1 No. 1 of "A New Weekly Journal exclusively devoted to the Discussion of Commercial and Financial Topics". *The Mining Journal*, then twenty-five years old, probably looked with some distaste on this upstart, for the then editor forebore to make any mention of the new journal.

Be that as it may, subscribers to the *Investor's Chronicle* were this week presented with a magnificent 175-page centenary number in addition to their regular weekly number. Containing twenty articles on the last hundred years in various sections of industry and finance, including a survey of 100 years of mining by Mr. H. A. Hake, the *Chronicle's* mining and oil editor, this special number will find a place on many bookshelves as a valuable work of reference.

We send our heartiest congratulations to the *Investor's Chronicle* on the completion of 100 years' service to the investor. May it continue to prosper during the next hundred!

Mr. J. Boyd, who was a director of The Grootvlei Pty. Mines, Ltd., and St. Helena Gold Mines, Ltd., died on May 29.

Mr. C. F. Braun has been appointed a director of North Charterland Exploration Co. (1937).

Mr. Frederic M. Bennett has been appointed to the board of Sir Lindsay Parkinson and Co.

Financial News and Results

Mason and Barry pays 5s.—Mason and Barry, the old-established copper-sulphur producer operating in Portugal, is recommending a final dividend of 2s. 6d. for 1959, making a total of 5s. for the year. Nothing was paid last year. The resumption of dividends has been made possible by an improvement in the operating profit from £35,954 to £98,362. Meeting, June 17.

Better Results from Malaysia.—Although the dividend is again passed, Malaysia Tin's results in 1959-60 showed a sharp recovery from those of the preceding year. After tax, profits amounted to £2,149, compared with a loss of £745. The carry forward is increased to £3,131. Meeting, July 14.

Bad Year for Yukon Consolidated.—After all charges, including Emergency Assistance, the net profit of Yukon Consolidated Gold in 1959 was \$38,853, compared with \$191,866 in the previous twelve months. The main reason for the decline was a fall of about \$130,000 in the actual mining profit, which in turn was caused by a fall of \$80,000 in revenue and an increase of \$50,000 in costs. Meeting, Vancouver, July 11.

Indian Copper Earns, Pays More.—At £1,202,259 before tax, profits of the Indian Copper Corporation for 1959 were more than £200,000 up on the results for the previous year. After tax and other charges, the net profit showed a striking improvement from £197,785 to £406,060. The proposed dividend is increased to 27 per cent absorbing £370,251 (last year: 18 per cent absorbing £246,834) and the balance carried forward is lifted to £107,121. Meeting, Calcutta, July 27.

Benguela Results.—Net revenue of the Benguela Railway in 1959 amounted to £1,967,727, slightly higher than in 1958, but well below the high level achieved in 1957. The dividend payable on the ordinary capital — owned by Tanganyika Concessions — totalled £1,024,845, and £774,140 of 4 per cent debentures were redeemed in advance. New 5 per cent debentures to the nominal value of Escudos 69,240,000, repayable as from July 1971, are to be issued to Tanganyika Concessions.

Another 4½d. from Brakpan.—Brakpan, one of the older producers of the Anglo American group, is to make a further capital repayment of 4½d. per share. This brings the total of repayments so far to 10½d. This leaves 3s. 10½d. as the possible total of future capital distributions, though, of course, there is no guarantee by the company that this total will be reached.

Rose Deep Return Confirmed.—The return of 3s. 3d. proposed by Rose Deep has been confirmed by the court. Payment will be made on or about August 4.

Milestone for Minerals Separation.—Gross profits of Minerals Separation passed a milestone in 1959, when they exceeded £1,000,000 for the first time. Net profits attributable to the parent company came out at £492,682, compared with £327,366, and the dividend was raised to 1s. per share on an increased capital. At the meeting, to be held on July 7, resolutions will be considered raising the authorised capital to make possible a one-for-four rights issue at 10s.

British Banking in Asia



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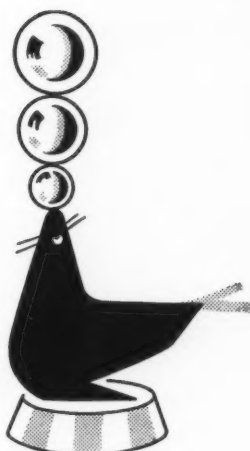
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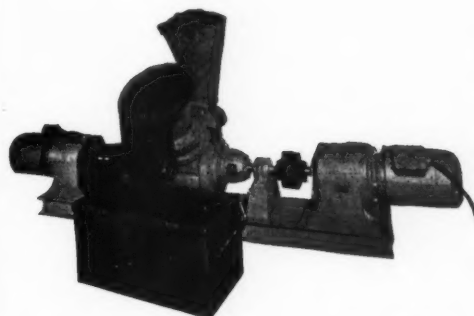
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Machinery and Equipment

System for Limiting Torque on Steam Winders

A system to prevent overspeed in steam wound colliery cages approaching shaft bottoms when men are being wound has been devised in No. 4 area, East Midlands Division, National Coal Board. The object of the system is to counteract the lack of sensitivity and time lags in winding control equipment on occasions when a sudden application of power occurs.

The principle of the system is to trip the engine controller if excess torque in favour of motion is applied when the cage is approaching the shaft bottom. Tripping is achieved by a spring- or weight-operated catch normally held by an electromagnet supplied by a low voltage d.c. circuit. In an emergency the magnet is de-energized and the catch is released to trip the controller.

To ensure that tripping only occurs when the cage is approaching the end of the wind, the system provides for the magnet to be energized at all other times. This is done by providing a circuit containing a switch which is operated by a cam gear linked with the shaft of the winding drum. The switch is closed except when a descending cage is within a fixed distance of the shaft bottom, and when the switch is closed the electromagnet is energized and full steam pressure can be applied to the engine. The cam gear is directional and allows full reverse power to be applied when approaching bottom and full power when raising from the bottom.

In parallel with the circuit containing the cam gear switch is a second circuit through which the electromagnet is still energized even when the cam switch is open, unless emergency conditions arise. In this second circuit are two trip switches operated respectively when excess steam pressure or excess throttle movement occur. If either of these conditions should occur when the cage is approaching pit bottom (and the cam switch has opened), the second circuit is also broken, the magnet is de-energized, and tripping occurs.

The trip switch controlled by steam pressure is actuated through a spring-loaded adjustable pressure cylinder, and the switch controlling throttle movement is operated by a striker on the throttle handle itself. A master switch cuts the tripping circuit when men are not being wound.

TEN THOUSAND FOOT DIAMOND DRILL

An Australian-designed diamond drill capable of going to 10,000 ft. in vertical or angle holes has been purchased from Mindrill Ltd., Melbourne, by Kalgoorlie Southern Gold Mine of Western Mining Corp. Ltd., Western Australia. Initially, the unit will be used for drilling 24-in. holes using an inclineable mast and 60-ft. drill rods. It has been described in *Engineering and Mining Journal*.

The head unit is the largest of its type ever made and is capable of rotating the nearly 2-mile long drill string. Two hydraulic cylinders are used for thrusting and lifting. Power transmitted through a torque converter (Cummins'

175 h.p.) and a hydraulic power-shift gearbox. Speed ranges from 200 to 1,500 r.p.m. in either direction. A single-drum hoist is used capable of hoisting 50,000 lb. at 300 f.p.m.

A conventional rotary table is used for rotary drilling that permits the use of a driving stem with 10-ft. working stroke (vertical holes only). The diamond drilling head employs a revolving quill-shaft geared to advance 33 in. The drill rods pass through the quill and are gripped by a chuck which releases at the end of the stroke; the quill shaft running back for another stroke.

EQUIPMENT FOR INDIAN COPPER MINE

The Indian Copper Corporation Ltd. has recently increased the output of its Masaboni mine in Bihar State to about 100 t.p.h., necessitating the replacement of the existing crushing equipment which was unable to cope with the increased rate. The Corporation has, therefore, installed a Blake crusher fitted with extra-wide jaws (50 in. x 16 in.), the plant being manufactured at the Fraser and Chalmers Engineering Works of The General Electric Co. Ltd. of England.

G.E.C. makes two sizes of Blake crushers with extra-wide jaws, namely 40 in. x 16 in. and 50 in. x 16 in. The particular value of these crushers is that they bridge the gap between the smaller range of jaw crushers and the larger true primary breaker. The two wide-jaw 16 in. crushers are specifically designed for reducing hard or tough ore which is not

more than 12 in. in size to 3-4 in. ring at the rate of 50-100 t.p.h.

This feed rate cannot be handled economically in any single primary machine in the normal range. A 30 in. x 16 in. jaw crusher has too small a capacity, and the next larger size in the normal range, a 36 in. x 24 in. machine, is too big, since it is designed to take pieces considerably coarser than 12 in. and is, therefore, unnecessarily heavy and expensive for the smaller size of ore. A gyratory crusher with a 16 in. feed opening is much too large, its capacity being nearer 150 t.p.h.

One method of handling the tonnage would be to install two 30 in. x 16 in. crushers, involving duplication of the feed and discharge arrangements, the motor and the switchgear, this being very costly. Thus the G.E.C. crushers with extra-wide jaws satisfactorily cover the intermediate range of 50-100 t.p.h. The manufacturers claim them to be cheaper both in the first cost and in running expenses than any other crusher or combination of crushers suitable for hard ore or rock. They have all the features of the company's improved design of Blake crushers, including all-welded construction throughout and roller bearings on the eccentric shaft for both the main frame and the pitman.

A 50 in. x 16 in. Blake crusher assembled in the Fraser and Chalmers Engineering Works of The General Electric Co. Ltd., before shipment to the Indian Copper Corporation Ltd.





The Mavotherm being used to test the temperature through the cover plate bearing-race whilst motor is running

DIRECT READING PORTABLE THERMOMETER

The Mavotherm is a comparatively new portable instrument for the measurement of temperatures in solids, liquids or gases. Ideally suitable for use in both laboratories and workshops for rapid accurate measurement of ambient or static temperatures, the Mavotherm is presented as combining accuracy and speed with safety and convenience. Reading time is between 3 and 4 secs. and accurate to ± 2 deg. C.

The instrument is battery-operated and under normal load conditions, its 1.5 volt battery will last for nearly a year. It has two ranges — 20 deg. C. — +90 deg. C. and +90 deg. C. — +200 deg. C. and the scale readings are calibrated in degrees centigrade. Two calibrated probes specially designed for easy access to difficult locations are supplied, and the whole instrument is contained within a strongly made plastic case.

The Mavotherm is manufactured by P. Gossen of Germany and is distributed in the United Kingdom by Avey Electric Ltd.

ROOFMASTERS IN POLAND

The Dowty Roofmaster self-advancing system of roof control, is now in operation in Zabrze Colliery in Poland. The Roofmaster has been installed on a face 60 in. high and 240 yd. long, in conjunction with a 125 h.p. shearer and an armoured conveyor. Installation commenced in late January, 1960, and was completed in only 14 working shifts by 18 men, including 2 Dowty service engineers. Working conditions were reasonable, with a soft floor, a hard grey shale roof and very hard abrasive coal. The stables were supported by using Dowty "Duke" hydraulic props and link bars.

Since the Roofmaster was installed, output is reported as having risen to an average of 23.5 tons per manshift, with a maximum of 41.6 tons per manshift.

Equipment Digest

A new electrode in the Ruby range of Diadem electrodes produced by Cooper and Turner Ltd., Sheffield, is the 14 gauge electrode in this series. The BS.1719 coding of this 14 gauge electrode is E217, it being a solid extruded, rutile based electrode suitable for use in all a.c. welding positions on mild steel, with an open circuit voltage of not less than 45 volts. Particular features of the electrode with regard to sheet metal welding are the easily controlled slag which allows either open arc or torch welding techniques to be employed together with a low degree of spatter.

The mechanical properties of the Ruby type electrode include a yield point of 24/28 tons sq. in., an ultimate tensile strength of 29/34 tons sq. in., the carbon content being in the range of 0.08 to 0.10 per cent with a manganese content of between 0.55 and 0.65 per cent. The core diameter is 0.104 in. and the electrode is supplied in 12 in. lengths. The current range is 65 amps. minimum to 80 amps maximum and the deposition rate at 72 amps is 71.7 lb. per cwt. of electrode.

★

The Electrical Equipment Division of Martindale Electric Co. Ltd., London, has introduced two new large capacity tools into its range of pulley, gear, fly-wheel and bearing pullers. The two new pullers have been produced to meet the demand from the heavy engineering industries for greater capacity tools.

The two new pullers are a 25-ton, 20-in. capacity and a 35-ton 26-in. capacity. The maximum spread of the pulling arms denotes the size of the puller, i.e., the 25-ton, 20-in. capacity tool has a maximum spread of 20 in. Heavy engineering industries, shipyards, locomotives and vehicle repair organizations will find many uses for these two new large capacity pullers.

In common with all Martindale pullers the new tools are available with twin or triple grips and the maximum reach of the pulling arms range from 21½ in. in the 20-in. capacity to 28 in. in the 26-in. capacity puller. The reach is, of course, determined by the spread required; the wider the spread of the pulling arms, the shorter their reach.

★

Increased safety for workers at high levels, or in other dangerous situations, is provided by a device which is used as a link between the worker's safety belt and a fixed anchorage. It contains 16 ft. of steel rope wound on a spring-loaded drum, and in normal use the rope is paid in and out automatically as the worker moves, to keep the line taut. As an alternative, a pre-set length of cable may be paid out to give the worker a radius of action within which it is slack.

If the worker should fall, the sudden rapid pay-out of the cable causes internal ratchets to engage a locking ring which rotates against a braking device. This results in rapid deceleration, and the fall is checked within 12 in.

A modified form of the device can be installed permanently on vertical ladders, so that each man climbing the ladder attaches the harness at the bottom and discards it at the top, whence it can be hauled down by the next user. The device was developed in Sweden and is available from Neldco Processes Ltd.

In the past few years, considerable attention has been directed towards the problem of short-circuit values which, under various conditions, can occur at a modern L.V. group motor control board comprising large banks of motor starters and associated apparatus. The tendency to use this form of control board has become pronounced and more extensive; this particularly applies in such industries as oil, chemicals, paper, flour, coal preparation, animal feeding stuffs and many others. The size of such plants today often demands quite large transformer capacity resulting in values of short-circuit not previously encountered in the field of motor starting equipment.

Because some of the thought directed to the problem has become confused, The Belmos Co. Ltd., has produced Leaflet PA 88:10 in an endeavour to set out the various fault conditions which can arise, to show that guessing the fault value may lead to unnecessarily costly equipment and that factors other than the impedance of the power transformer have an important bearing on the problem.

★

When using any form of flanged wheel running on rails, rubbing between the wheel flange and the side of the rail is a source of wear and noise which cannot easily be reduced. Attempts to provide lubrication of the rubbing surfaces are likely to cause trouble by leakage of lubricant to the railhead.

A device has been introduced to provide lubrication by means of a stick of dry lubricant, kept in contact with the wheel flange by spring pressure. This maintains lubrication where it is required and is unaffected by dirt or adverse weather conditions, but the dry solid lubricant cannot seep to the railhead and cause trouble. Both molybdenum disulphide and graphite lubricants are available in stick form. The device is manufactured by Denco Engineering Services Ltd.

★

Small solids in bulk can be handled very simply by a screw-type elevator which has been developed primarily for lifting small coal to the hopper of automatic stokers.

A worm rotates continuously in a long tube, at the upper end of which the drive motor is supported. The tube is slung at the required angle by a single fixing near the upper end, with its lower end resting in the bulk of the material. An opening at the lower end of the tube exposes the rotating screw, and provides the input feed. Suitable delivery chutes can be attached at the upper end.

The elevators are made with tubes up to 18 ft. in length, and will handle up to 1½ tons per hr. They are manufactured by Bennis Combustion Ltd., Manchester.

For Sale—300 KW. Mercury Arc Rectifier, Input 6,600 volts. Output 500 volts 600 amps. with tapings by E.C.C. Equipment about 4 years old, practically unused Price—£1,250, original cost £4,000. Davidsons Engineers (M/cr) Limited, Irkdale Street, Smedley Road, Cheetham Hill, Manchester 8. Telephone No. COLlyhurst 1610.

BOARD CHANGES

Mr. J. Herbert Bennetts, manager of Geevor Tin Mines, Ltd., since March 1, 1944, is retiring from that position on June 30, 1960, but will retain his seat on the board of directors of the company.

Mr. D. H. Batchelor, who has been appointed manager to succeed Mr. Bennetts, is a graduate of the Camborne School of Mines, and has had wide experience on the Copperbelt in Northern Rhodesia, where he occupied important positions including that of underground manager of Bancroft Mines, Ltd., from which he has recently retired.

BURMA MINES
LIMITED

reports that the operations of

BURMA CORPORATION
(1951) LIMITED

for the Quarter ended March 31, 1960, resulted in an estimated **Net Profit of K.8,73,000 (£65,475)** and for the NINE months to that date **K.17,17,000 (£128,775)** an increase of **K.2,36,600 (£17,745)** over the corresponding period for the previous year.

Details of Revenue, Expenditure, Ore Extraction and Production may be obtained from Central Registration Limited, 9 Basinghall Street, London, E.C.2, upon application.

Additionally the Board of Burma Corporation (1951) Limited states:—

"Contrary to the expectation referred to in the Report for the Quarter ended December 31, 1959, the estimated results for the Quarter under review are very much better than was anticipated. This is because the recovery in Mine production in the Quarter was much greater than was expected. The improvement in Gross Revenue, as compared with the previous Quarter, resulted mainly from:—

- Substantial increases in the quantities of Refined Lead, Silver and Zinc Concentrates produced.
- Larger Pig Lead sales at improved prices and higher quantities of Zinc Concentrates shipped.
- An increase in the quantities and values of metals on hand at the end of the Quarter as compared with December 31, 1959.

Whilst Operational Expenditure increased only fractionally the increase in overall expenditure is attributable entirely to realization charges on the larger quantities of major products sold."

Rand and Orange Free State Returns for May

GOLD OUTPUT AND PROFIT

Company	May 1960			Year ends	Current Financial Year Total to Date			Last Financial Year Total to Date		
	Tons (000)	Yield (oz.)	Profit† (£000)		Tons (000)	Yield (oz.)	Profit† (£000)	Tons (000)	Yield (oz.)	Profit† (£000)
Gold Fields										
Doornfontein	105	42,263	214.9	J	1,055	428,585	2129.8	974	404,144	2060.4
Libanon	117	27,668	68.0	J	1,233	290,686	692.5	1,088	257,502	594.4
Luipaards Vlei	68	11,853	4.5	J	764	134,165	56.7	760	132,414	25.7
Rietfontein	16	4,131	6.1	D	80	20,966	32.9	80	21,003	35.5
Robinson	42	9,851	1.8	D	226	48,401	112.6	308	65,332	172.2
Simmer & Jack	74	13,391	1.1	D	384	67,813	148.9	437	81,810	138.0
Sub Nigel	66	15,155	17.6	J	726	169,600	205.6	725	174,953	268.0
Venterspost	130	34,093	78.2	J	1,377	350,795	672.2	1,407	349,919	639.2
Vlakfontein	52	18,700	88.8	D	257	91,233	434.9	250	89,843	423.8
Vogels	85	18,369	19.5	D	430	92,309	103.2	463	104,283	198.0
West Drie	130	120,055	1,070,824	J	1,230	1,128,831	9687.2	925	871,532	7128.1
Anglo American										
Brakpan	146	17,419	13.5	D	710	85,859	60.2	685	82,585	52.2
Daggas	233	47,156	226.4	D	1,159	233,803	1139.9	1,187	241,241	1205.4
East Daggas	106	18,020	40.6	D	524	88,794	201.5	488	81,004	150.0
F. S. Geduld	95	82,358	658.7	S	750	643,534	5156.0	614	469,814	3446.9
President Brand	118	95,606	839.7	S	925	755,087	6637.0	797	614,789	5193.1
President Steyn	105	40,236	181.5	S	814	318,131	1448.9	769	299,022	1516.5
S.A. Lands	98	20,440	43.3	D	479	99,598	211.5	469	98,548	279.6
Springs	102	14,251	14.2	D	515	71,704	74.3	517	70,754	54.9
Vaal Reefs	102	44,775	233.4	D	476	214,200	1112.3	417	188,987	1011.7
Welkom	102	32,255	82.0	S	779	245,753	583.8	746	227,848	514.4
Western Holdings	150	100,146	833.0	S	1,153	762,133	6284.1	846	504,932	3840.9
West. Reefs. Ex.	145	41,104	139.8	D	690	194,184	643.5	610	158,321	447.2
Central Mining										
Blyvoor	128	84,119	635.6	J	1,397	916,846	6949.4	1,217	792,829	5722.2
City Deep	119	23,590	6.0	D	559	116,319	27.3	567	118,718	51.6
Cons. M.R.	62	12,852	5.2	J	910	175,936	73.4	1,473	221,611	153.9
Crown	193	33,478	7.8	D	994	166,759	22.0	1,104	173,259	46.4
D. Roodepoort	198	36,095	49.6	D	955	174,671	246.6	930	172,058	262.5
East Rand Prop.	277	55,659	85.6	D	1,088	275,617	447.8	1,097	283,717	603.3
Harmony	160	64,828	295.7	J	1,595	637,835	2835.7	1,171	467,175	1861.3
Modder East	136	13,151	0.6	J	1,488	145,125	6.9	1,467	145,616	24.6
Rose Deep	23	4,362	1.5	D	125	21,439	5.3	200	26,496	1.2
J.C.I.*										
Freddie's Cons.	60	13,470	44.8	D	289	65,682	224.4	282	69,917	1183.2
Govt. G.M.A.	54	10,902	0.5	D	265	53,997	2.6	268	53,238	1.5
Randfontein	23	4,536	3.1	D	113	21,971	15.5	163	27,834	43.5
Union Corporation										
East Geduld	136	40,120	260.8	D	666	196,264	1275.6	670	203,275	1363.4
Geduld Prop.	72	12,962	21.3	D	367	66,169	124.5	354	62,614	95.5
Grootvlei	215	44,722	225.1	D	1,070	223,114	1138.7	1,015	215,080	1072.9
Marievale	99	24,180	126.9	D	492	120,481	623.8	453	113,203	540.6
St. Helena	167	56,786	354.3	D	785	263,846	1620.4	715	213,243	1122.6
Van Dyk	75	12,421	11.3	D	360	60,957	52.1	381	71,247	128.4
Winkelhaak	85	26,776	126.5	D	410	126,852	563.2	358	85,787	136.6
General Mining										
Buffelsfontein	148	58,635	316.0	J	1,578	612,550	3207.7	1,378	475,963	2239.0
Ellaton	30	7,064	27.6	D	142	33,620	126.0	154	36,236	148.5
S. Roodepoort	30	7,230	23.4	J	328	78,340	249.8	326	77,671	258.1
Stilfontein	167	75,150	393.8	D	783	352,480	1827.6	675	335,672	2092.4
W. Rand Cons.	141	20,526	14.1	D	647	92,821	27.7	664	96,351	87.0
Anglo Transvaal										
Hartebeestfontein	120	55,800	318.2	J	1,117	548,745	3287.5	956	181,312	3520.7
Lorraine	82	17,425	116.8	S	620	129,077	1162.8	601	117,476	1151.7
N. Klerksdorp	12	1,305	1.4	J	55	6,291	1.2	50	5,360	1.4
Rand Leases	186	28,004	15.0	J	2,036	305,043	252.2	2,011	295,690	165.0
Village M. R.	33	4,566	1.1	J	335	51,342	7.7	293	47,523	9.8
Virginia O.F.S.	136	28,560	5.3	J	1,459	328,311	145.0	1,277	294,251	331.9
Others										
N. Kleinfontein	79	10,266	1.4	D	392	50,965	6.2	412	53,665	15.4
Wit Nigel	20	4,389	5.4	J	207	48,040	57.9	196	47,582	63.9

Gold has been valued at 249s. 5d. per oz. fine (April 249s. 5d.). L indicates loss. † Working Profit. *Working Profit includes sundry revenue. Table excludes profits from Uranium, Pyrite and Acid, and also production from Uranium divisions at Luipaards Vlei, Randfontein and W. Rand Consolidated.

ESTIMATED URANIUM REVENUE

Company	Year ends	May 1960			Company	Year ends	May 1960		
		Profit (£000)	This Year (cum.) (£000)	Last Year (cum.) (£000)			Profit (£000)	This Year (cum.) (£000)	Last Year (cum.) (£000)
Goldfields					J.C.I.				
Doornfontein	J	15.0	164.0	159.0	E. Champ d'Or (b)	D	7.1*	35.2*	32.9*
Luipaards Vlei (a)	J	94.0	1028.0	957.0	Freddie's Cons.	D	29.0*	150.0*	168.0*
Vogels	D	55.0	274.0	256.0	Govt. G.M.A.	D	23.0*	115.2*	110.2*
West Drie	J	50.0	548.0	515.0	Randfontein (a)	D	107.9*	548.1*	532.6*
Anglo American					General Mining				
Daggafontein	D	144.0	707.1	693.5	Buffelsfontein	J	213.0	2324.0	2216.0
P. Brand	S	47.5	374.3	368.2	Ellaton	D	18.0	88.0	92.0
P. Steyn	S	63.6	491.6	480.9	Stilfontein	D	88.0	449.0	438.0
Vaal Reefs	D	143.0	718.8	702.3	W. Rand Cons. (a)	D	208.2	1045.0	998.4
Welkom	S	61.0	469.2	455.4	Anglo Transvaal				
West Reefs. Ex.	D	166.6	815.6	789.0	Hartebeestfontein	J	259.0	2874.6	2848.6
Central Mining					Lorraine	S	34.0	283.0	274.0
Harmony	J	165.0	1686.2	1701.4	N. Klerksdorp	D	10.0	52.5	55.0
	J	239.6	2271.6	1716.2	Virginia O.F.S.	J	177.1	1948.6	2016.2

Table includes profit from uranium acid and pyrite before loan redemption. (a) Total profit from uranium section. (b) Overall profit. * Net revenue after provision for loan redemption.

Chemical Grout Seals Porous Sandstone

A chemical that "gels" water and prevents dangerous seepage, a major problem of mining and tunnelling, has successfully sealed porous sandstone through which shafts were being sunk in a Scottish coal mine. Quantities of this chemical, developed by the American Cyanamid Co. and known as AM-9 Chemical Grout (*The Mining Journal*, January 29, 1960), were injected into the sandstone at depths below 2,000 ft. during shaft sinking at the Monkton Hall colliery in Midlothian.

Cementation engineers in their report have described the operation at Monkton Hall colliery.

The main AM-9 ingredient was mixed at ground level with water and part of the catalyst chemicals and delivered to a holding tank at the bottom of the shaft through a shaft range. The other main chemical necessary to the polymerization, ammonium persulphate, was made up in solution at the bottom of the shaft in batches of 5 gal. which were added to 5 gal. batches of the AM-9 solution to form 10 gal. of fully mixed grout. This grout was injected directly into the ground under pressure by means of a standard Cementation pump.

Treatment of the full depth (approximately 48 ft.) of the sandstone bed was carried out from the sump in a series of phases. Three concentric rings of injection holes were provided in the sump. The first injections (AM-9, Series I) towards the top of the sandstone bed were made entirely with AM-9 and were carried out primarily to establish the best technique. A total of 3,470 gal. of grout was injected into 16 holes, and subsequent redrilling of injection holes showed a considerably reduced inflow of water.

Prior to the remainder of the AM-9 injection, a preliminary protective curtain was formed with a penetrating but relatively weak silicate grout in the zone immediately outside the ground to be treated with AM-9. This envelope was intended to provide a barrier that would prevent undue loss of the AM-9 through any particular open fissures that might exist.

One hundred gal. of AM-9 grout were injected in each of the Series II holes in the section 20 ft. to 40 ft. below the sump. Gel-time was half an hour. Injection rates were from 2-4 g.p.m. Pressures at the end of injection varied from 1,300 to 2,500 p.s.i. In the AM-9 Series III holes, the grout volumes injected ranged from nil to 300 gal. per hole and in the Series IV holes, ranged from nil to 400 gal. per hole.

Before injection the water flow into the sump from the open holes drilled to 60 ft. depth was 144 g.p.m. When the shaft had been sunk through the full depth of the bed of sandstone the water make from the wall was roughly 40 g.p.m. Of this it is estimated that about two-thirds came from above the sandstone bed or from the upper part of the bed into which the injection stand pipes were fixed and which did not receive treatment.

On the basis of these figures, inflow has been reduced to about one-tenth. It should be appreciated, however, that the volumes of inflow after excavation are from the full bore of the shaft in the porous rock, while the inflow from the drilled holes was from pipes of 2 in. dia. It is likely that the flow resistance of the sandstone has been increased by AM-9 treatment in greater measure than the figures of inflow suggest.

Wolf Electric Tools have considerably extended their Glasgow branch, increasing the floor space by about 40 per cent. The enlarged branch, which will now handle all sales as well as servicing, is under the management of Mr. A. Stringer, who was formerly at the company's London Head Office.

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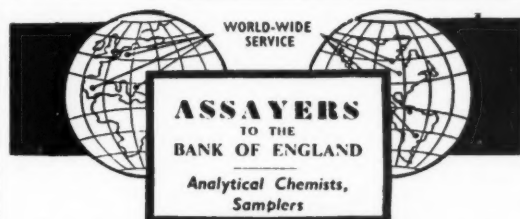
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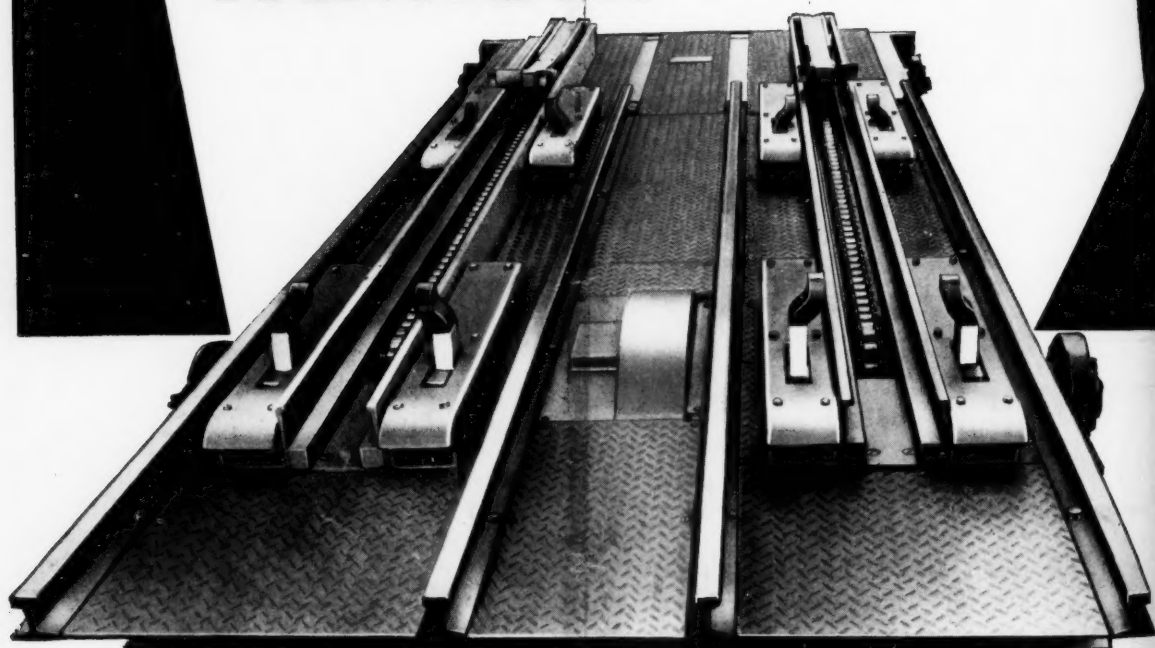
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